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Thru the Ages with Hughes Rock Bits

Painted for the Hughes Tool Research Division Collection by John Pemberton Cowan

In the CRETACEOUS PERIOD dinosaurs reached their maximum development. Reconstructed above* is Triceratops Prorsus, armored dinosaur of the Cretaceous Period. In the background are two giant flying reptiles, Pterodactyl Pteranodon.

*Full size color prints of this original painting will be sent upon request.

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Hughes TOOL COMPANY HOUSTON, TEXAS
Standard of the Industry

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OCTOBER 5, 1946

Cycle WITH NORDSTROMS

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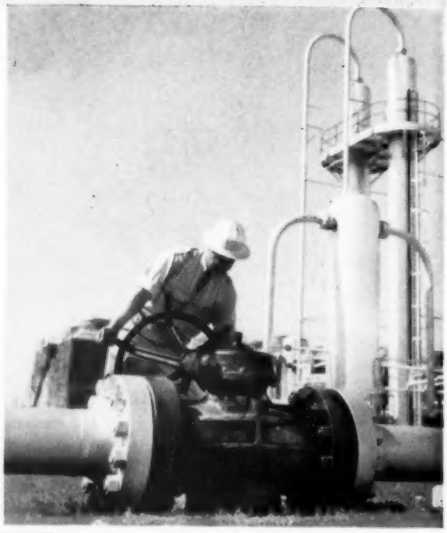

ABOVE: Nordstrom Valve on high pressure gas line in Katy Cycling Plant, Texas. AT LEFT: Nordstrom Cylinder-Operated Hypreseal Valves in the same plant.

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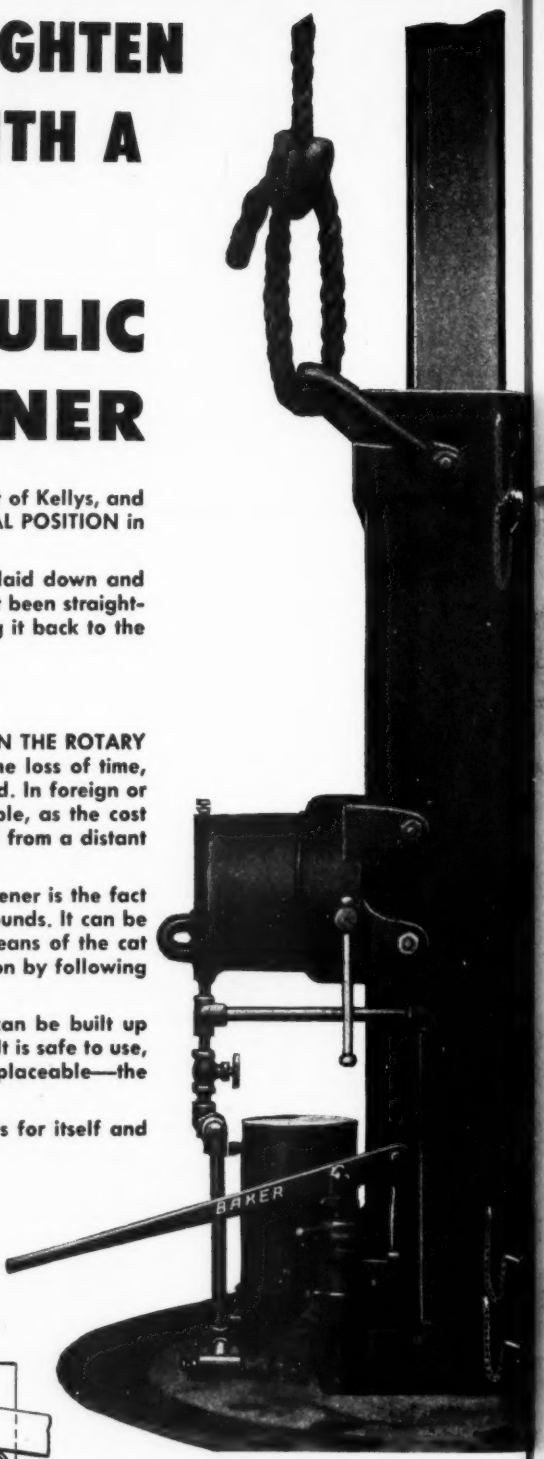
THE BEST WAY TO STRAIGHTEN KELLYS AND PIPE IS WITH A

BAKER

PORTABLE HYDRAULIC KELLY STRAIGHTENER



It is a SAFE, SIMPLE and INEXPENSIVE operation to take the kinks out of Kellys, and the bends out of pipe when they are hanging in a NORMAL VERTICAL POSITION in the derrick.

Probably more Kellys are bent during transportation, and in being laid down and picked up, than from any other cause. Frequently a Kelly that has just been straightened in a shop will again be bent during the process of transporting it back to the well, rolling it off the truck, and dragging it into the rig.

EASY TO STRAIGHTEN IN THE DERRICK

When the Baker Kelly Straightener is used, the job is done RIGHT ON THE ROTARY TABLE with the Kelly hanging in its normal position. The hazards, the loss of time, and the expense of transporting and handling are entirely eliminated. In foreign or isolated fields the Baker Kelly Straightener is considered indispensable, as the cost and the loss of time in transporting a bent Kelly or drill pipe to and from a distant shop are serious matters.

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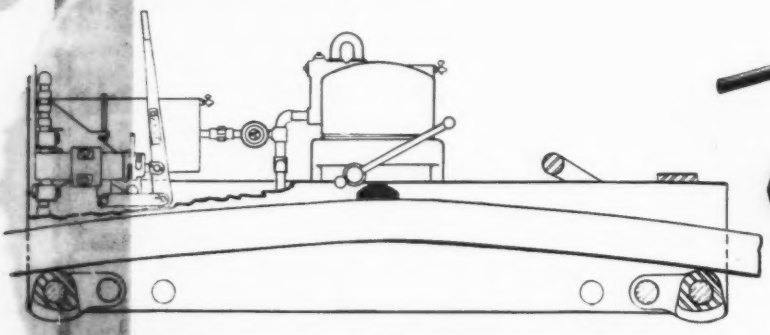
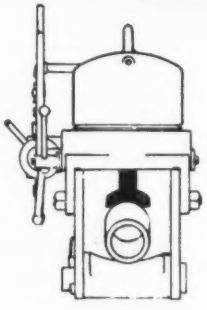
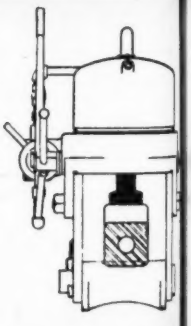
Pressure sufficient to straighten 8¾" diameter Kellys or drill pipe can be built up without undue exertion, by manual operation of the hydraulic pump. It is safe to use, and the only parts subjected to wear are inexpensive and readily replaceable—the body and pump will last indefinitely.

Ask for details and prices on this efficient device which quickly pays for itself and then pays dividends for a long, long time.







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THE OIL AND GAS JOURNAL

Standard Oil

AN article appearing in a widely distributed business publication last summer explaining the growth of the Standard Oil group of companies since the dissolution decree of 1911, has been commented upon outside the oil industry because it revealed the highly competitive operations of several of the dissolved units in today's oil activities. Some within the oil business itself have not realized how completely separated these companies have become in their operations.

At present four of the offshoots are much larger in assets than was the original Standard company when a splitting up of its activities became mandatory under the antitrust acts. In fact these four companies each have one or more subsidiaries which are larger than the Standard Oil of 36 years ago. It was pointed out in the analysis that the inevitable result of the growth of the dissevered units has been an overlapping in market activities with as many as six companies selling their products in the same area. What the article did not explain, of even greater importance, was the industrial fact that these companies compete daily in all divisions, starting with exploration and extending through manufacturing.

These evolutionary developments need to be analyzed in the light of recent surveys which reveal that a majority of consumers still think of the dissolved Standard Oil companies, including concerns bearing other names, as having one ownership and management. This attitude includes assumption that the Rockefellers are dominant in ownership, whereas in fact their varied interests have no investments in most of the companies and represent less than 10 per cent of the stock in the remaining companies.

Present conditions obviously are not a matter of operating concern to the companies involved. There is no consumer prejudice toward the Standard group in product purchases and over-all this so-called Standard birthright is an operating asset in many ways rather than the contrary.

The only question is whether conditions have not reached the point where it would be to the advantage of everyone concerned that the development explained in the business paper and generally recognized within the oil business be also fully appreciated by the public—that the Standard Oil of predissolution days has been superseded by several organizations entirely distinct in ownership and management.

What this would mean in public attitude is indicated from the reaction of new legislators who initiate oil investigations with the objective of revealing practices commonly associated with monopoly in industry. These lawmakers oftentimes have expressed amazement as actual competitive conditions are revealed to them at hearings. That fact explains why investigations designed to smear the oil business in recent years have failed. Inquiries of this type might never develop in the future if a well-enlightened public opinion has the facts as regards today's Standard Oil.

Texas Co. Expansion Program Involves Pipe Lines, Refineries

A MAJOR construction program starting next year and involving important additions to its pipe-line transportation and refining facilities has been approved by officials of The Texas Co. The pipe-line program as announced by B. E. Hull, president of the Texas Pipe Line Co., includes two major lines in the Texas Gulf Coast area.

It was also confirmed that the company is making an engineering study with the view of constructing, with other interests, a 440-mile 20-in. line from West Texas fields to Oklahoma. Tentative plans for the 20-in. pipe line call for the crude-oil carrier to originate at a point west of Midland, Tex., and extend through the North Texas area to Cushing, Okla. Capacity of the line is rated at 150,000 bbl. per day.

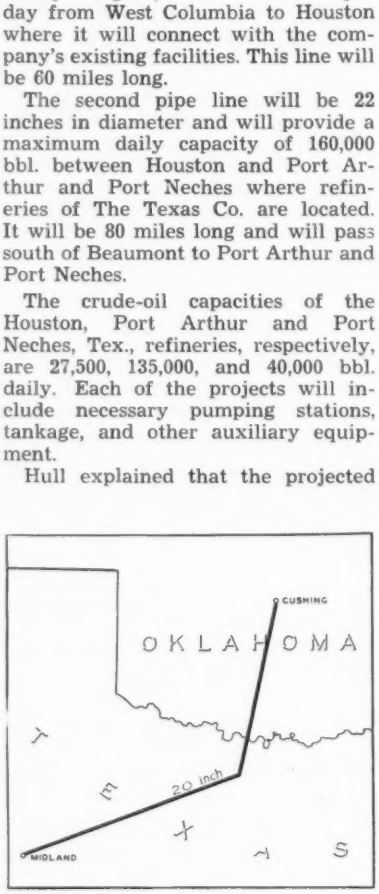
Hull stated the company will proceed immediately with field work but explained actual construction of the two crude oil lines in Texas Gulf Coast area would not get under way until midyear in 1947, due to delays in obtaining delivery of line pipe, other materials, and equipment.

One new pipe line will be 16 inches in diameter and will be capable of transporting 90,000 bbl. of crude per day from West Columbia to Houston where it will connect with the company's existing facilities. This line will be 60 miles long.

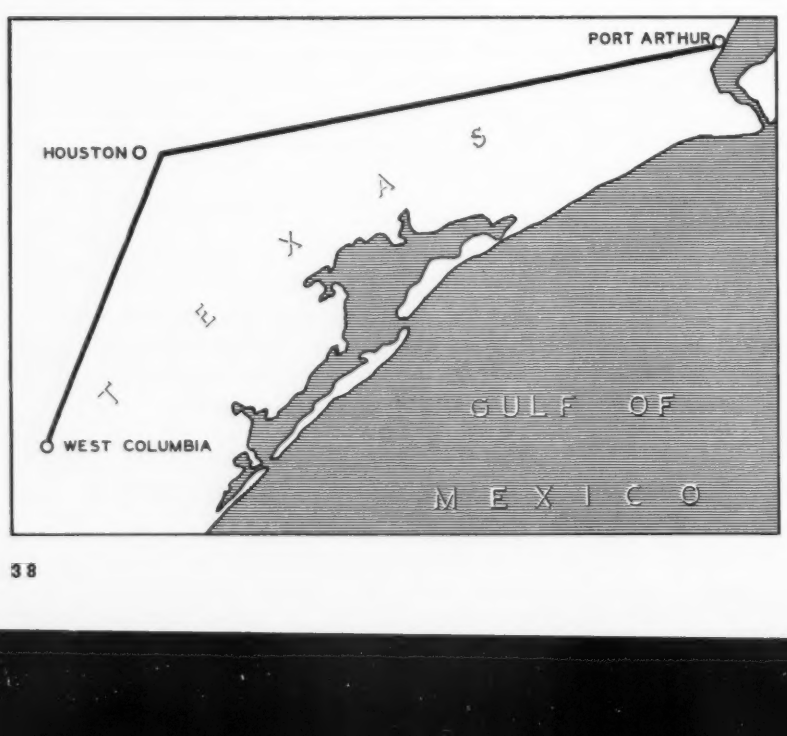
The second pipe line will be 22 inches in diameter and will provide a maximum daily capacity of 160,000 bbl. between Houston and Port Arthur and Port Neches where refineries of The Texas Co. are located. It will be 80 miles long and will pass south of Beaumont to Port Arthur and Port Neches.

The crude-oil capacities of the Houston, Port Arthur and Port Neches, Tex., refineries, respectively, are 27,500, 135,000, and 40,000 bbl. daily. Each of the projects will include necessary pumping stations, tankage, and other auxiliary equipment.

Hull explained that the projected construction programs are intended to supplement and, in some instances, replace existing facilities of the company, which are inadequate to provide necessary outlets from the various producing areas and to handle the volume of crude petroleum required to meet shippers' demands. He said that, if the required material and equipment can be obtained without unnecessary delay, the large oil arteries may be placed in operation on or before January 1, 1948.



Texas Pipe Line Co.'s 1947 program embraces construction of two major crude lines in the Houston area—one, a 16-in. 60-mile line from West Colombia to Houston; the second, a 22-in., 80-mile line from Houston to Port Arthur and Port Neches. The company also is making an engineering study, with other interests, of a 440-mile, 20-in. line from West Texas to Oklahoma



Refinery Construction

While no announcement has been made regarding the refinery-construction program, it is understood that it includes an enlargement and modernization program for Texas Co. refineries in Oklahoma and Illinois as part of the 1947 and 1948 plans.

The 20-in. line will tie into existing system of The Texas Co. and other interests which extends from Oklahoma to Lockport, Ill., where the company's largest Middle West refinery is located. The Texas Co. part of the 20-in. system will also result in additional crude oil being available to the company's 22,000-bbl. West Tulsa, Okla., refinery and its 30,000-bbl. refinery at Lawrenceville, Ill. It is understood that catalytic-cracking capacity will be added to the present thermal-cracking facilities of the West Tulsa and Lawrenceville refineries. The Lockport refinery has a crude-oil capacity of 50,000 bbl. daily and earlier in the year completed a 20,000-bbl. catalytic-cracking unit of the fluid type. The company has a similar type unit under construction at its Casper, Wyo., refinery. The company also recently announced plans to build a new refinery in the Philadelphia area to operate with either Gulf Coast or foreign crude-oil supplies.

The Texas Co. for many years has had jointly owned pipe-line operations to its Middle Western refineries with Cities Service Co., the lines originating in Oklahoma. Cities Service recently announced a large expansion program for its East Chicago refinery located at East Chicago. The present rated crude-oil capacity of this plant is 30,000 bbl. daily.

Phillips Reported Planning West Texas-Cushing Line

Phillips Petroleum Co., according to unconfirmed reports, has plans for laying a 12-in. crude-oil line from West Texas via Borger to Cushing, Okla.

The line would supply the company's Borger refinery and move oil to Cushing where it would be shipped through the lines of other companies to its Kansas City refinery. Phillips now has a gathering system in Ector and Andrews counties. Work would start late in 1947.

Du Pont Announces Plans to Market TEL in 1948

NEW YORK.—Du Pont Co., which has been manufacturing tetraethyl lead antiknock mixtures for Ethyl Corp. since 1925, announced last week it will begin marketing the fluid some time in 1948.

Ethyl's patents, under which billions of gallons of motor fuel have been treated with antiknock compound, are expiring. The basic patents covering the manufacture of tetraethyl lead already have run out, while those covering its use in gasoline will expire in 1947.

Ethyl Corp. is jointly owned by Standard Oil Co. of New Jersey and General Motors Corp. Ethyl has its own plants and will continue in business.

In connection with the plans for expansion in the field of petroleum additives, Du Pont also announces the appointment of Ray E. Miller, former vice president of Warren Petroleum Corp., Tulsa, as sales director for petroleum additives in the organic-chemicals department, and J. J. Mikita, formerly associate research director of The Texas Co., as an assistant to J. R. Sabina, technical director of petroleum-chemicals division.

Du Pont's petroleum-chemicals division markets antioxidants, colors, metal deactivators, and color stabilizers for motor fuels, as well as antioxidants, corrosion inhibitors, fluorescing agents, and extreme-pressure lubricant bases for petroleum lubricants.

Miller has long been associated with the oil industry. Born in Burlington, Iowa, he attended the University of Missouri, and in World War 1 was an Army flying instructor. In 1920, he became safety engineer and personnel manager for Marland Oil Co. Eight years later, he was named executive secretary of the National Gasoline Association of America, and in 1943-1944, he headed that organization. In 1934, he joined Hanlon-Buchanan, Inc., as a vice president, a post he held until becoming vice president of Warren early this year.

Mikita was born in Heilwood, Pa., and was graduated from The Pennsylvania State College in 1932. He became a research assistant at the college, and 3 years later, in 1936, he joined The Texas Co. as a mechanical engineer in the Beacon, N. Y., laboratory. He was moved up to supervisor of engineering research in 1939, then became associate director of research in the company's New York headquarters.

Pogue Says Oil Industry Is Example in Resources Development

PRINCETON, N. J.—The way in which the petroleum industry has met its conservation and development problems offers the possibility of wider application in the development of natural resources in general, Joseph E. Pogue, vice president of the Chase National Bank and an eminent authority on oil, said this week in an address at the Princeton University Bicentennial.

In the field of international relations, Pogue said coordination of the policies of producing and consuming nations, as suggested in the proposed international oil compact, and with the support of a constructive national oil policy, "would constitute machinery for the solution of oil problems in the international field and could contribute to the vigorous development of the world's oil resources in a manner conducive to economic stability and world peace."

In a discussion on "Engineering and Human Affairs," Pogue declared the petroleum industry contains most, if not all, of the problems found in resource development in general—"essentiality, limited supply, susceptibility to multiplication by technology, expanding demand, international aspects, and sensitivity to the actions of the state."

Briefly reviewing the operations of the petroleum industry, Pogue pointed out that technological advances are continually enlarging the ultimate possible supply, despite frequent predictions of early exhaustion, and said the "paramount issue" so far as resources are concerned, is "for a setting and procedures conducive to optimum development of technology."

"In the realm of efficient extraction of petroleum from the ground, the petroleum industry has achieved notable progress," he said. "This has been accomplished with the aid of state conservation laws, since the small leaseholds prevailing in the United States necessitate offset drilling and hasty withdrawals of the oil if not countered by a restraining influence. . . . Thus practical conservation has been achieved together with some measure of stabilization of the industry, without unduly impairing the freedom of individual action so necessary for multiple effort."

Kansas Reinstates 15-Bbl. Minimum Well Allowable

WICHITA, Kans.—Kansas this week returned to the prewar 15-bbl. daily minimum-well allowable as a result of an order of the state Corporation Commission which was regarded as likely to be contested later in court.

By a divided 2-1 decision, the commission held it has no discretion but must abide by the 15-bbl. definition set out in the state's basic proration law of 1931. Kansas operated on a 25-bbl. daily minimum well allowable during the war and on a 20-bbl. plan after May 1. Many operators, particularly independents, had sought a return to the 25-bbl. minimum rating.

Oklahoma, Louisiana Up October Allowable

Increases in crude-oil allowables for October have been made by regulatory bodies in Oklahoma and Louisiana, while Kansas production for the month was held unchanged.

The Oklahoma Corporation Commission this week ordered a daily allowable production of 353,625 bbl. This total compares with a September allowable of 350,220 bbl. daily which went into effect when West Edmond field production was cut from 77,000 to 40,000 bbl. daily in an effort to curtail gas flaring.

Another record-high allowable was set by the Louisiana Conservation Department for October. Total for the state was placed at 435,890 bbl. daily, including 337,768 bbl. for South Louisiana fields and 98,122 bbl. for North Louisiana fields. September allowable was 430,742 bbl. daily; August, 429,405 bbl. daily; and July, 423,641 bbl. daily. The Kansas Corporation Commission approved a daily allowable of 270,000 bbl., unchanged from September.

Sunray Rejects Union

TULSA.—In an election conducted by the National Labor Relations Board, employes of Sunray Oil Co., Tulsa, recently rejected the International Oil Workers Union, C.I.O., as their bargaining representative. A majority vote was registered against the union, and the labor board has dismissed the union petition.

Petroleum Council Tackles Six Government-Industry Problems

by Henry D. Ralph

WASHINGTON.—The National Petroleum Council, at its second quarterly meeting September 26, accepted the invitation that it become an advisory body to the secretary of interior and agreed on a plan of organization and procedure to carry out this purpose.

A resolution was adopted which constitutes a sort of constitution and bylaws, and the council immediately went to work, through special committees, on three problems on which industry advice was requested—the critical condition in pressure tank cars, the shortages of steel, lead, and other materials needed by the oil industry, and new regulations under the revised mineral leasing law.

A few members still raised doubts that the council is desirable, or that it could serve any useful purpose, but there were no dissenting votes on adoption of the recommendations of the organizing committee. The agreed procedure was prepared with careful consideration of the antitrust laws and the several letters from the attorney-general regarding the legal scope of the NPC's activities.

Advisory Capacity

Under the plan of action adopted, the council will serve only in an advisory capacity to the Department of the Interior regarding relations between the oil and gas industry and the Government. This will not necessarily be confined to laws administered by the department, because Interior officials frequently are called on to advise other government agencies on industry problems.

A standing agenda committee of 11 members will study each request from Interior officials and advise the council whether or not it should be considered. To make sure that no subject discussed will impinge on the antitrust laws it is provided that the agenda committee include at least three lawyers who may or may not be members of NPC.

There is also a standing appointments committee of 11 members to assist the chairman in selecting special committees to study and report on given topics after their consideration has been approved by the agenda committee and the council. These committees may include persons not members of NPC, but all are to be selected on the basis of their training, experience, and general qualifications to deal with the matter assigned, and they are expected to vote as individuals.

Meetings of both the council and all committees are to be open to members of Congress and government officials who desire to attend and to such other persons as may be invited by the Interior Department or the chairman of the council.

Full minutes and reports of all proceedings are to be filed with the Oil and Gas Division, which may make them public if OGD desires. All requests for consideration of any topic are to be in writing. Individual council members may make their views part of the record by submitting written statements for incorporation in the minutes.

The council may agree on its own internal organization and procedure and on the advice which it will give to the secretary or director, but it will not reach any agreements of any other nature. It will not concern itself with the industry's operating problems, trade practices, or the like, and it will not engage in any of the usual trade-association activities.

What Council May Do

Membership on the council will be by appointment by the secretary of the interior, members serving for 1 year. Immediately after the annual appointments the members will hold an organization meeting and elect new officers and standing committees, but special committees are to be dissolved as soon as they have completed their assignments. Council meetings will be held quarterly at dates fixed by the chairman, but special meetings may be called on the request of 25 members. All meetings will be held at a place designated by the Interior Department.

Officers of the council will be a chairman and vice chairman who will serve without pay, and a secretary-treasurer who will be a paid official and who may or may not be a member of the council.

Expenses of the council, not to exceed $50,000 annually, will be met by a fund raised from voluntary contributions from the industry. Details of the budget and method of raising the fund have not yet been determined. The secretary-treasurer will be selected by the chairman and the appointments committee.

Permanent officers were not selected at the September 26 meeting, but there was a general feeling that Walter S. Hallanan, of Plymouth Oil Co., who served as temporary chairman following the initial meeting June 21, should continue as chairman.

Fifty-five of the 85 council members were present at the meeting.

Ralph K. Davies, acting director of the Oil and Gas Division, presented a letter listing six subjects on which the division sought advice and asked the council to report on them. These were (1) the compilation and analysis of petroleum statistics on a worldwide basis, (2) the shortage of pressure tank cars, (3) shortage of various materials needed by the industry, (4) revision of regulations under the mineral leasing law, (5) future availability of fuels for military aircraft, and (6) domestic reserves, imports, foreign development, and other aspects of a national oil policy.

The council authorized the appointment of special committees to deal with topics 2, 3, and 4, and referred the others to its agenda committee for further study.

Agenda Committee Members

The agenda committee is composed of the following: George A. Hill, Jr., Houston Oil of Texas, temporary chairman; A. Jacobsen, Amerada Petroleum; B. A. Hardey, I.P.A.A.; W. H. Ferguson, Continental Oil; R. G. Follis, Standard Oil of California; A. C. Mattei, Honolulu Oil; Gordon Duke, Southeastern Oil; William R. Boyd, Jr., A.P.I.; J. Howard Marshall, Ashland Oil & Refining; and Hines Baker, Humble Oil & Refining. The latter two are attorneys and not members of the council.

The appointments committee consists of W. Alton Jones, Cities Service, temporary chairman; B. Brewster Jennings, Socony-Vacuum; W. S. S. Rodgers, The Texas Co.; Robert E. Wilson, Standard of Indiana; H. L. Thatcher, National Council of Independent Petroleum Associations; Jake L. Hamon, Cox & Hamon; Charles F. Roeser, Roeser & Pendleton; Frank M. Porter, Mid-Continent Oil and Gas Association; Henry D. Moyle, Wasatch Oil Refining; E. E. Pyles, Los Angeles; and Charles S. Jones, Richfield Oil Corp.

The appointments committee selected the following to serve on the three functional committees authorized by the agenda committee:

Pressure tank cars—Charles R. Musgrave, Phillips Petroleum, chairman; Paul J. Bond, Pure Oil; H. E. Coyl, General American Transportation Co.; C. F. Dowd, Tide Water Associated; B. C. Graves, Union Tank Car Co.; Charles S. Jones, Richfield; J. R. Parten, Woodley Petroleum, and W. K. Warren, Warren Petroleum.

Scarce materials—Claude P. Parsons, Hughes Tool, chairman; William W. Beck, General Petroleum; Frank F. Brinegar, Continental Supply; Bruce K. Brown, Standard of Indiana; John Guoines, Magnolia Petroleum; Harold Howard, Howard Supply; Reese H. Taylor, Union Oil of California; Fred Manning, Fred Manning Co.; and William T. Payne, American Association of Oil Well Drilling Contractors.

Leasing-act regulations—W. H. Ferguson, Continental Oil, chairman; H. H. Healy, Ohio Oil; A. C. Mattei, Honolulu Oil; Gilbert J. Mueller, Argo Oil; M. H. Robineau, Frontier Refining, and R. S. Shannon, Pioneer Oil Corp.

THIS 1946 S M T W T F S WEEK

INTERNATIONAL—Venezuelan industry threatened by another year-end tax levy. . . . Minister of Fomento says three leading parties have agreed in principle on excess-profits levy but emphasizes tax will be such as not to discourage foreign capital. . . . ¶Russian radio reports drilling of Europe's deepest well, about 12,800 ft., near Baku. . . . ¶Vacuum Oil Co., Ltd., Standard Vacuum subsidiary, lays plans for $3,000,000 Australian refinery to operate on Venezuelan crude. . . . ¶London reports says British company, partly backed by the Bank of England, is preparing to build plant near Manchester to process petroleum by "Catarole process," said to produce both liquid aromatic hydrocarbons and gaseous olefins at the same time. . . . ¶Hungarian American Oil Co. officials prepare report placing damage to Hungarian fields at about $10,000,000 as a result of Russian overproduction. . . . ¶Unconfirmed reports from Rio de Janeiro, Brazil, says well in Bahia suburb has been brought in for 1,780 bbl. daily. . . . ¶Mexican Government makes $4,085,000 payment on American expropriation claims. . . . Final payment due September 1947. . . . ¶Sinclair, Cities Service company gets 20-year concession in Panama. . . .

EXPANSION—Texas Co. outlines major construction program for 1947. . . . Two new crude lines, 16 and 22-in., planned for Texas Gulf Coast area. . . . Company studies possible construction with other companies of 20-in. crude line from West Texas to Cushing, Okla. . . . Refinery expansion understood to include enlargement and modernization for plants in Oklahoma and Illinois.

PRODUCTION—Kansas reverts back to 15-bbl. minimum well allowable over opposition of independents. . . . Order effective October 1. . . . ¶Tests on well operated by Stanolind for unitized Elk Basin operators indicates possible new pay and substantial additional reserves for the field. . . . ¶Texas operators study precedent-setting Railroad Commission order for Stratton field which attempts to equalize withdrawal of oil and gas on volumetric displacement basis. . . . ¶Bureau of Mines launches investigation of reservoir conditions in Cabin Creek, West Virginia field, using helium as a tracer gas. . . .

TRANSPORTATION—Phillips reported planning 12-in. crude line from West Texas to Oklahoma. . . . Part of oil would supply Phillips Kansas City plant with movement through other lines from Cushing. . . . ¶Sinclair reveals project to build products line from Corpus Christi to Austin. . . . ¶American Association of Railroads advisory boards estimate rail movement of crude and products in final 1946 quarter will be 3.8 per cent higher than same 1945 period. . . . ¶Representatives of Mid-Continent refiners again protest proposed 25 per cent freight rate increase before ICC in Washington. . . .

THE GOVERNMENT—National Petroleum Council meets in Washington, votes to continue organization within limitations of antitrust laws as prescribed by attorney-general. . . . Receives Davies request for assistance on six current industry-government problems. . . . ¶Wendell Berge, assistant attorney-general, in address before National Oil Marketers Association in Chicago, warns that membership on council or its committees does not confer blanket antitrust immunity and asserts no advisory committee should become exclusive channel by which industry's views are transmitted to Government. . . .

The National Petroleum Council held its second quarterly meeting last week in Washington, and despite the doubts expressed as to its ability to function effectively under present laws and restrictions, took steps toward setting up a permanent organization. Details of the meeting are given on the opposite page. In the picture, standing, is B. A. Hardey, president of the Independent Petroleum Association of America. Around the head of the table are Robert Friedman, counsel for the Oil and Gas Division; Russell Brown, council secretary; R. K. Davies, acting OGD director; W. S. Hallanan, president, Plymouth Oil Co. and temporary council chairman; and Jim V. Brown, assistant secretary. Along the right side of the table ranging down from the stenographer are D. P. Hamilton, president, Root Petroleum Co.; H. C. Wiess, president, Humble Oil & Refining Co.; Joseph E. Pogue, vice president, Chase National Bank; and Robert H. Colley, president, Atlantic Refining Co.

International

WORLD-WIDE OIL DEVELOPMENTS

Sinclair Panama Given 20-Year Concession for Isthmian Production

by Warren W. Burns

NEW YORK.—A 20-year concession to explore for and produce oil in the Republic of Panama has been granted to Sinclair Panama Oil Corp., owned by Venezuelan Petroleum Co. and Cities Service Co. Venezuelan Petroleum Co. is largely owned by Sinclair.

The concession covers an area aggregating about 7,250,000 hectares (approximately 17,762,500 acres), Harry F. Sinclair, president of Sinclair Oil Corp., explained. The company has the privilege of extending the 20-year concession for an additional 20 years.

Within 90 days following the effective date of the contract, the company has obligated itself to commence exploration work. After 3 years of exploratory work, the company may select, if it so wishes, areas which it desires to retain. All other lands not selected and retained during the 3-year period are to be thereafter excluded from the concession. The company is required to begin drilling operations within 6 months following the expiration of the 3-year period.

The Panamanian company is required to pay $25,000 a year for each of the 3 years of the exploration period and thereafter to pay rentals on acreage retained for development. Moreover, the company is obligated to pay to the Panamanian Republic a royalty of 16⅔ per cent on gross production of crude oil and the same royalty of gas production. Panama may elect to receive the royalty oil in kind rather than the cash value.

According to the Panamanian Constitution, the subsoil belongs to the nation. In cases where private landowners have acquired subsoil rights, however, prior to the effective date of the constitution, the landowner is to be entitled to one-third of the 16⅔ per cent royalty to be paid to the government.

The right to build refineries, and to manufacture, transport, and market petroleum and its products is included in the concession. When undertaken, such activities will result in the government receiving 25 per cent of net profits.

The company will follow a policy of training Panamanian personnel for a period of 10 years and to employ in its operations the greatest number of Panamanian citizens.

Terms of the Sinclair Panama concession have been hailed by Pres. Dr. Enrique A. Jimenez of Panama as "very advantageous to the government." He added that "it will now be ascertained whether the existence of oil pools in our country is a myth or a reality."

Officers of Company

Officers of the Sinclair company are: L. V. Stanford, president; W. F. Dau, vice president and treasurer; and O. M. Gerstung, secretary. On the board of directors are: Stanford, Dau, Gerstung, H. L. Phillips (chairman of Venezuelan Petroleum Co.), and R. V. Whetzel (manager of Cities Service's foreign department).

The interest over the possibilities of oil in Panama goes back many years. Sinclair, Gulf Oil Corp. and Cities Service have drilled wells, all of which were dry holes with the exception of a well drilled by Gulf at Garachine, about 120 miles southeast of Panama City near the Pacific Coast. The Garachine well, however, was never a commercial producer and in 1928 Gulf pulled out of Panama.

Sinclair drilled some wells on Colombus Island off the Atlantic Coast and struck gas in one. Cities Service drilled three wells in the so-called Darien area, in eastern Panama, about 1928. All were dry holes with the deepest at 3,500 ft. Other drilling which has been done in Panama includes the single dry hole drilled by the now defunct Carib Syndicate at David, 100 miles from Panama City on the Pacific Coast.

Excess-Profits Tax Being Considered in Venezuela

NEW YORK. — Another indication that the Venezuelan Government is considering the enactment of some kind of an excess-profits tax before the end of this year, was given here last week by that country's Minister of Fomento Dr. Juan Pablo Perez Alfonzo.

At a press conference, Perez Alfonzo said that the three leading parties which are expected to poll the largest number of votes at the October 27 election — Conservatives, Liberal Progressives, and Communists—have agreed in principle that an excess-profits tax should be imposed on corporations.

The rates at which such a tax might be levied have not been disclosed, but he expressed the opinion that the rate probably would be lower than the special tax levied last year which amounted to 20 per cent at the highest income levels. It will be a reasonable tax, he emphasized, "as we do not wish to discourage foreign capital."

The tax which amounted to 20 per cent in some cases, and which the Minister of Fomento referred to, was the one enacted December 31, 1945, and aimed to establish for Venezuela a working capital in excess of 100,000,000 bolivars. Forty industries were affected by the tax, but the oil companies—which pay about 50 per cent of all taxes in Venezuela—were principally affected. Creole Petroleum Corp., the largest oil producer in Venezuela—and in the world—paid an additional $18,679,000 as a result of the December 31 decree.

Earlier this year Perez Alfonzo indicated that Venezuela's revolutionary government was not completely satisfied with the present distribution of industry profits. And before the 1943 petroleum law was enacted, both Perez Alfonzo and the Revolutionary Junta's President Romulo

Betancourt opposed the law on the ground that it did not give the government an equitable participation in times of extra profits.

Asked for more details on Venezuela's tax plans, after the press conference, Perez Alfonzo told the Journal that his government's opinion was the same as stated a few months ago and referred to the following statement which he made at that time:

"The government has formally declared that it will not resort to new taxes. (Betancourt announced this last February). However, it appears reasonable to me to think that the Constitutional Government, elected by popular and direct vote, which is awaited by all Venezuelans, necessarily must enact an excess-profits tax which will prevent exaggerated exploitation of the people and their natural riches."

Perez Alfonzo pointed out that while the 1943 law provides that royalties can be reduced, when it is shown operating costs are cutting profits, the law does not provide any means of paying greater royalties during extraordinary profit periods.

The government would like to see some such provision incorporated into the law, the Minister of Fomento said. Until that time, an excess-profits tax may be the answer, he indicated.

Perez Alfonzo is in the United States, with Alejandro Oropeza-Castillo, president of Venezuelan Development Corp., on a "strictly business" trip, instigated by the desperate economic plight of, paradoxically, one of the world's richest nations. Venezuela's total value of exports—and the country is the greatest exporter of oil—during the past 10 years has been $2,850,000,000. But imports have been only slightly more than $1,000,000,000, Perez Alfonzo stated.

"Our people cannot eat the excess dollars or the gold, and they can't drink the oil," the minister said. "We are desperately poor in food, clothing, housing, transportation facilities —all the basic needs of a country that feels it has earned a normal standard of living."

An effort will be made to convince U. S. business men of Venezuela's needs and the long-term values in selling and shipping goods to that country.

Italy's Bari Refinery to Resume Operations This Month

by Antonio Giordano

MILAN, Italy.—Latest information published on the oil agreement between the Italian Government and the Anglo-American oil companies indicates that the Bari refinery of the Azienda Nazionale Idrogenazione Combustibili will resume operations early in October. About 25,000 tons monthly (about 5,800 bbl. daily) of crude oil are to be treated, and of the output 30 per cent will be gasoline, plus burning oils destined for consumption on the Italian market.

Allied authorities at the Bari port have agreed to place at the disposal of A.N.I.C. sufficient coasting tanks to guarantee operation of the refinery.

It also has been decided to speed up reconstruction of all Italian refineries, and it is expected that by year's end the Venice, Naples, and La Spezia plants will be in operation.

An understanding has been reached as to cost of the reconstruction and the expenses for enlargement with reference to Italian oil policy. Products refined in Bari will replace a corresponding quantity of products imported through the UNRRA. Though as a whole Italy's supplies of oil and petroleum products are to be increased for the time being and for the immediate future, the available quantity of gasoline is to remain unaltered. Furthermore, owing to the difficulties to put again in operation lubricating-oil plants, no lubricants will be produced in Italy in the near future, and all these requirements are to be covered through imports.

The agreement signed between the Italian Government, UNRRA, Royal Dutch Shell, Standard Oil Co. (N. J.) and Vacuum Oil Co. in order to develop the supply of oil and petroleum products to the Italian market assumes considerable importance in view of the following results:

1. The increase of the quantity of the oil and petroleum products supplied to the Italian market from an average of 400,000 centals monthly to 800,000 centals monthly. (1 cental equals about 15 gal.)

2. The starting of reconstruction of the Italian oil refineries.

3. Transfer of the oil distribution from the Comitato Italiano Petroli (C.I.P.) to the private companies.

In the negotiations which resulted in the oil agreement also reported under discussion the possibility of investment of foreign capital in A.N.I.C. and the opportunity of constructing new refining plants, especially in Southern Italy and in Sicily, particularly with reference to the falling of the Trieste oil industry under Eastern influence. The Italian Government has not concealed its readiness to grant every fiscal and custom facility to new refining enterprises in Italy. It is considered a possibility that some of the existing Trieste refineries might be acquired by a Swiss subsidiary of Russian-Romanian oil interests.

Among the proposals which Russia has made to Italy in regard to Italo-Russian economic cooperation there is the plan to supply oil-refining machinery provided Italy should engage to become the center of distribution of Russian oil in the Western Mediterranean.

It is stated in connection with the recent Anglo-American agreement that the Italian Government refuses to grant any privilege to a single oil concern but intends to grant all companies the same authority. It also appears that pressure made upon the Italian Government by private concerns has led to a decision to abolish fiscal pressure upon companies exploiting natural-gas wells to favor the employment of gas for the output of electricity owing to the shortage of coal. Premiums are to be granted for the construction of gas pipe lines. Furthermore, of considerable importance are transactions concluded between Italy and foreign countries to get petroleum products through barter. In this connection comes into consideration the supply of 25,000 tons (about 175,000 bbl.) of gas oil from France and reports regarding Russian support to the negotiations carried on with the Italian Government by the Azienda Italo-Romena Petroli in order to bring Romanian oil exports on the Italian market.

International

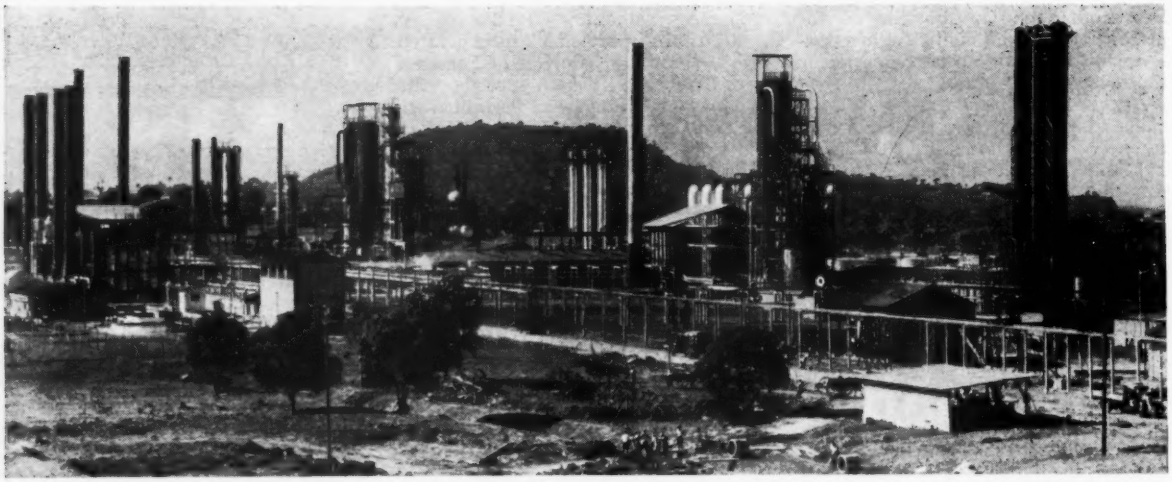
WORLD-WIDE OIL DEVELOPMENTS

Tropical's Products-Line Projects in Colombia

Tropical Oil Co. has plans for a 125-mile refined-products pipe line from the company's Barranca Bermeja refinery to a terminal at La Dorado, Colombia, from which shipments are to go to Bogota by a 100-mile railroad. Construction is to start in 1947 and to be completed in 1948. Other products-line projects planned are La Dorado-Manizales, 110 miles; Puerto Berrio-Medillin, 100 miles.

New Guinea Exploration

BATAVIA, Java. — Plans are now being made for an exploration party of the Netherlands New Guinea Exploration Committee to search for oil in unexplored territory beyond the Carstensz Mountain range in Dutch New Guinea.



General view of eastern division of the Trinidad Leaseholds, Ltd., refinery at Pointe au Pierre, Trinidad, B.W.I.

Trinidad Leaseholds Applies Advanced Methods in Drilling and Production

by Paul Reed

IN the operation of the oil fields characteristic of Trinidad, in the British West Indies, a number of advanced technical practices have been developed by Trinidad Leaseholds, Ltd., the largest producing and refining company on the island. In recent years, particularly during the period of the war, there has been a growing appreciation of the significance of Trinidad as an oil-producing and oil-refining area.

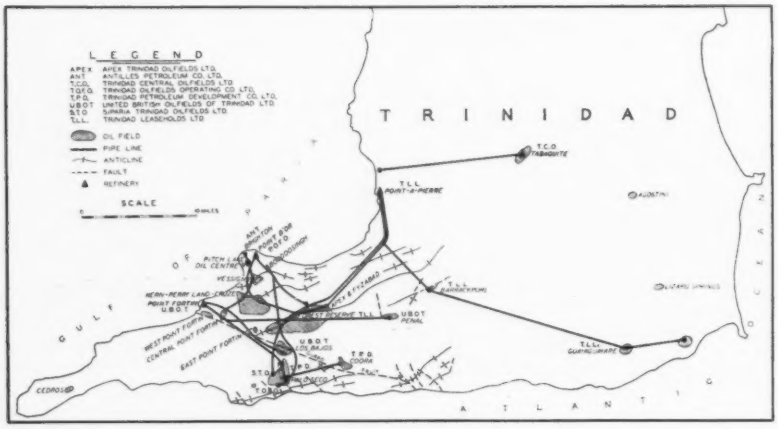
Although the principal producing fields, as at present developed, all lie within an area of less than 20 by 30 miles and although oil production has actively developed only during the last 30 years, Trinidad has established itself as one of the important producing and refining territories of the South American region, with a production of around 60,000 bbl. daily of crude oil of many types. With the largest reserves of any Crown Colony in the British Empire and with modern refineries, Trinidad at the center of the crossroads between the Eastern and Western hemispheres, could not fail to become a most valuable fuel reserve for the United Nations.

International
WORLD-WIDE OIL DEVELOPMENTS

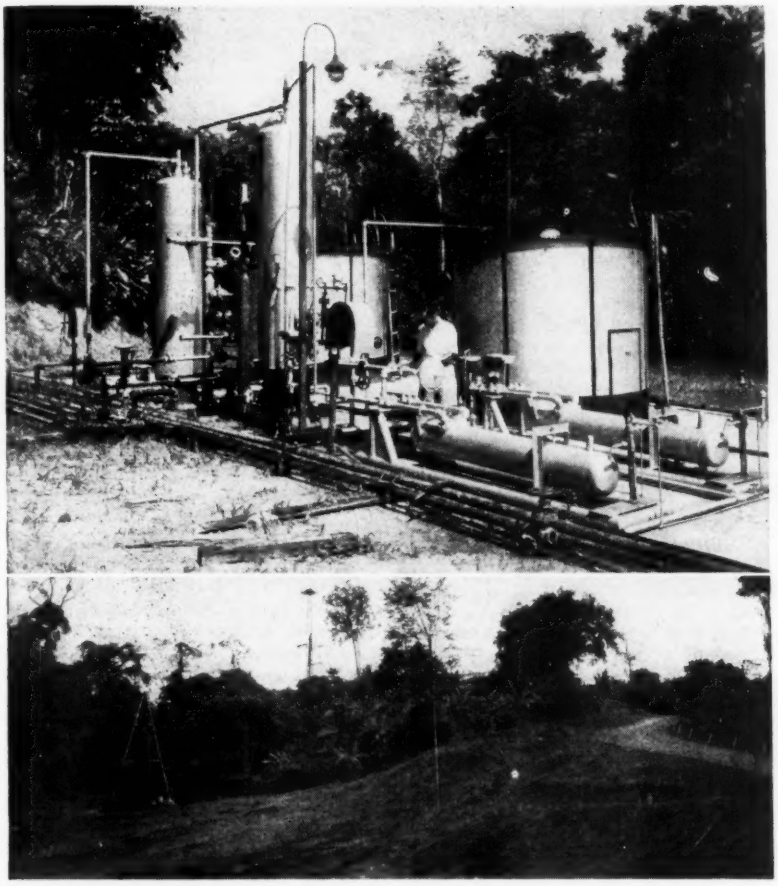
Operations at the Island of Trinidad—with the largest reserves of any crown colony of the British Empire—require careful technical control because of the complex nature of structures and deposition, which is often of the deltaic dump type. This article deals with reservoir study, drilling, production, and the exploration program.

As the war continued and the withdrawal from Trinidad's oil reserves increased, it became obvious that the postwar period would be one of accelerated exploration to compensate for this drain. It is for this reason that nearly all producing companies in Trinidad are now expanding their exploration programs, not only in the vicinity of producing areas, but also in the relatively large, untested areas of the southeastern parts of the island and, in the near future, in the offshore areas in the waters of the Gulf of Paria.

The principal oil fields of Trinidad lie in the Tertiary beds of the Southern Range, an area of heavily forested country. Until recent years, nearly all production has been drawn from the Miocene, but recent developments have resulted in substantial production being obtained from the Oligocene, while the Cretaceous holds out possibilities which are by no means inconsiderable.



Oil fields and pipe lines of companies operating on the Island of Trinidad, B.W.I.



Top: Double blow-case equipment with separators and tanks in the Forest Reserve field. Above: Forest Reserve Well No. 4a (with tripod derrick) produces at a depth of 550 ft. from a steeply dipping sand formation which outcrops at seeps close to highway seen at the right

Opportunity of obtaining much of the information in this article was afforded to the author on a recent visit to Trinidad by the assistance of A. J. Ruthven Murray, general manager of Trinidad Leaseholds, Ltd., F. H. L. Tindall, manager, fields division, and J. W. Hardy, production manager, while other information was provided by the technical staff of the Government Mines Department of the colony.

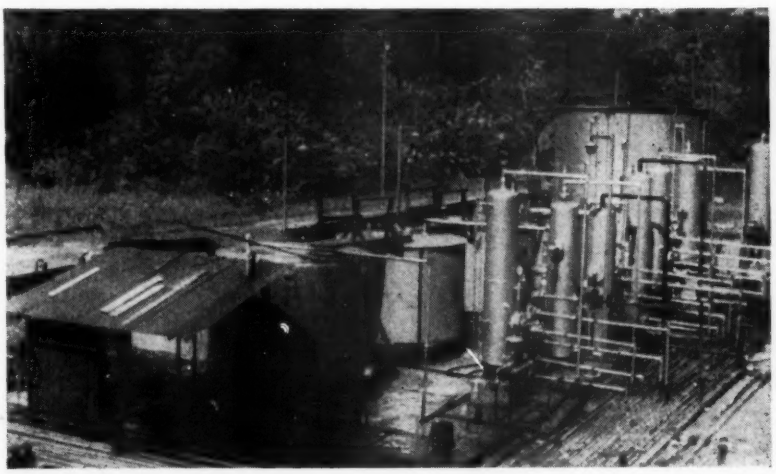
A feature of Trinidad Leaseholds, Ltd., and most other oil operators on the island is the importance which they attach to the technical control of their operations. Though such a condition is to be desired wherever oil-production operations are proceeding, it is an absolute necessity in fields of the type found in Trinidad where subsurface conditions are amazingly complex.

In Trinidad Leaseholds, the Geological, Physical and Survey Division includes technicians concerned with reservoir definition and control. Among these technicians are included exploration geologists, exploitation geologists, production physicists, paleontologists, and petrographers. Attached to the drilling department are drilling engineers who function as completion engineers and with whom are associated the mud engineers. The drilling department, however, operates in very close collaboration with the geological division so that all developments have the benefit of the best possible technical control. The geological division operates its own laboratories dealing with core examination and analysis; determination of gas solubility, oil compressibility, etc.; paleontological and petrographical studies; testing of mud materials, cement, deemulsification agents, etc.

Drilling in Trinidad presents very considerable problems due to abnormally high formation pressures (up to 0.8 lb. per foot from surface) which often renders necessary the use of muds weighing as much as 130 lb. per cubic foot.

Apart from the difficulties due to high pressures, abnormal losses of circulation occur on occasion, sometimes in drilling through horizons previously exploited, but at other times apparently into cavities. Mud treatment is, therefore, a highly developed technique. The local shales, as a general rule, furnish a drilling mud of good wall-building properties and, in fact, when heavy muds are being used, the principal problem is to reduce the viscosities caused by the inclusion of soft cuttings into the mud stream. Viscosity reduction is achieved with quebracho and Calgon, the chemicals being added under the supervision of the mud engineer. Central mud plants are employed, mud being returned from the rigs for reconditioning.

At the present time, most of the drilling rigs are steam operated, though there is a trend towards the introduction of diesel rigs, particularly



Dehydration plant at Forest Reserve field (Photo by A. Haley).

for exploration drilling. The steam rig has remained in use in Trinidad for longer than might have been anticipated, partly because there are adequate supplies of natural gas and good water, but principally because during the war period it was impossible to replace obsolescent equipment. In the early part of this year, there were, on average, 24 rigs operating in Trinidad, of which 8 were drilling exploration wells; these included all the diesel rigs available.

Road building is one of the major problems in Trinidad, where the rainy season, with an average rainfall of 63 in., lasts from April to December. Roads are built in the main with a corduroy wood foundation, and artificial or natural burnt clay (porcellanite) as a surface. Major roads in developed areas are completed with a surfacing of unrefined pitch from Pitch Lake at La Brea. The building of roads involves the cutting of heavy bush and a considerable amount of earthwork which is done nowadays almost entirely by bulldozers. Road costs run to about $30,000 per mile, roads to exploratory wells being usually from 1 to 5 miles in length.

Trinidad's producing wells, as a rule, come in flowing with static bottom-hole pressures of up to 0.8 lb. per foot of depth from the deeper horizons. The average well gives an ultimate production of between 100 and 150 thousand barrels, but some major producers have yielded over 1,000,000 bbl. and, in certain cases, are still flowing.

Due to the complex nature of the underground structure and of the deposition, which is often of deltaic dump type, very detailed subsurface study is necessary to avoid drilling of dry or unnecessary wells. Continuous reservoirs covering more than 100 acres are uncommon; a customary well spacing is 533 ft. between wells (5.6 acres per well). In the case of T.L.L., the subsurface geologists have developed a type of contoured reservoir map on which electric-log data in miniature are placed at the points representing the wells. These reservoir maps, in conjunction with numerous cross-sections, have proved invaluable for the proper delimitation of reservoirs which is an essential preliminary to the reservoir control exercised by the production physicist. Nearly all wells in Trinidad are electrically logged, usually from surface to bottom, electric logging having been standard practice in the island since 1930. Shortly before the war, Trinidad Leaseholds made a complete survey by gamma-ray logging of the wells drilled prior to the introduction of electric logging. This survey enabled many dubious points of correlation to be settled and a considerable amount of reperforating of old wells is resulting from it.

In addition to electric logging, nearly all wells are directionally surveyed for deviation, since with dips of usually 25°-50° on the flanks of the fields, very considerable drift of wells can take place unless careful control is exercised during drilling.

The largest producing field in the Island of Trinidad is that of Forest Reserve, operated by T.L.L., with a present producing rate of 14,000 bbl. per day (reduced from the wartime peak of 17,000 bbl.). Due to the nature of the deposition, this is a multiple field which, though vertically segregated into two main producing formations, actually consists of some 50 or more separable reservoirs. Production which in the past was drawn almost entirely from the higher horizons of the Forest formation is now principally drawn from the underlying Cruse formation. In the early days of development, wells were often completed at less than 1,000 ft. deep, in sands outcropping at the surface sometimes less than 100 ft. away from the well. Average drilling depth at the present time is between 5,000 and 6,000 ft. The present policy is to drill all wells to the lowest possible producing horizon and complete them by solid cementing a blank string of 6⅝-in. casing.

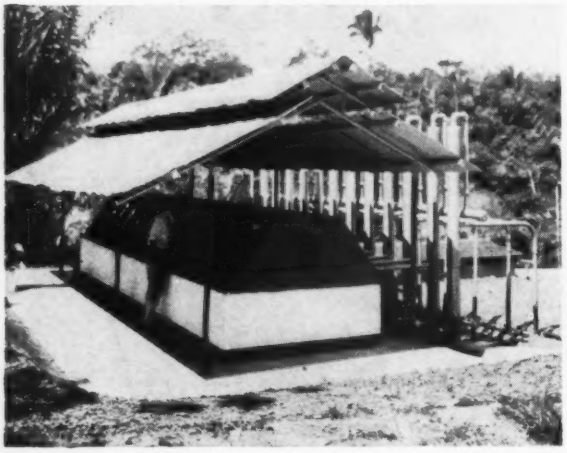
Gun perforating with three ⅜-in. shots per foot is the usual method of completion, the perforations being restricted, when possible, to a single reservoir, i.e. probably from 20 to 50 ft. of exposed oil sand. The wells are flowed through 2-in. tubing with conventional christmas trees. All flowing wells are equipped with recording pressure gages at the well head. Dual completions are not favored owing to the deposition of wax between strings and the tendency of the wells to make sand and mud.

As a general rule, water drives are a rarity in Trinidad and where they occur (as at Norne Diablo) are of the expansion type. Under normal gas-expansion conditions, primary recoveries are expected to range between 200 and 300 bbl. per acre-foot, de-

(Continued on page 139)

Right: Casing, tubing, and well-head connections of a 700-ft. well through an asphalt deposit to an oil sand. Subsequently the asphalt has been quarried. Standing by the well is J. W. Hardy, production manager, T.L.L. Originally the well head was at a normal distance above the former surface of the ground

Below: Battery of enclosed meters operating on the dump-bucket principle; these measure the production from individual wells. Separator equipment for each of the 12 wells served appears in the rear



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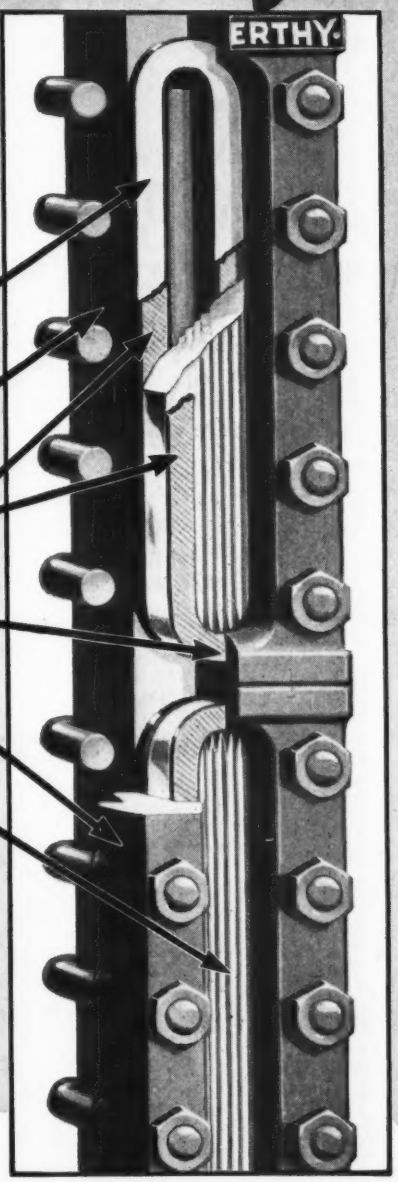

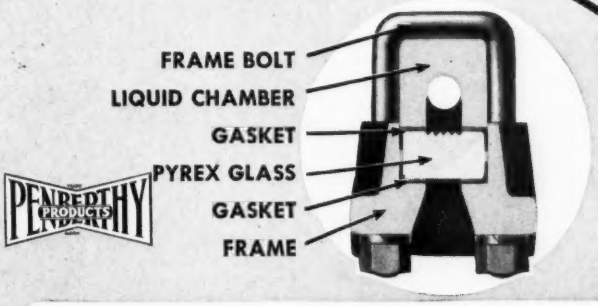

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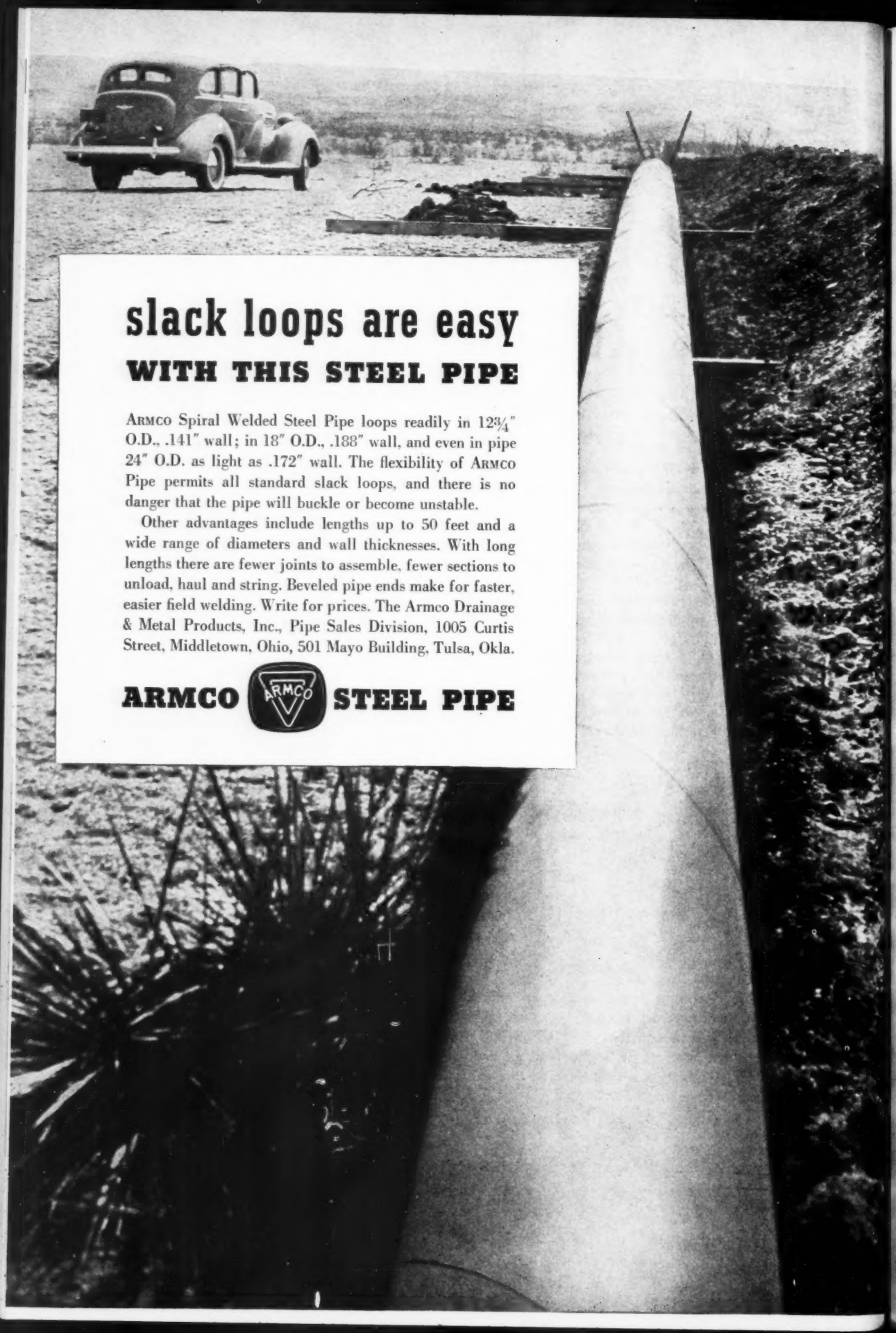

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Grease-Making Science Rapidly Expanding, Technologists Say

THE science of proper grease-making methods is still in its infancy, say leading technologists of the Lubricating-Grease Institute of America gathered in Chicago for their fourteenth annual meeting.

Adopting latest equipment for making better greases, they are turning to the electron microscope and other ultramodern aids.

The construction industry is trending strongly in the direction of power lubrication methods and equipment. Charles I. Krause, of the Alemite Division, Stewart Warner Corp., said in discussing modern lubrication methods. The principal advantages of power lubrication are the saving of up to more than 50 per cent of the time formerly consumed in old-fashioned hand processes. Krause said the same ideas have spread to the mining industry where power used to apply lubricants makes more certain the supplying of the proper amount at the proper places in the required condition. Farmers also are moving in on lubrication, and the result is better service from lubricants in all severe farm services. Krause stated centralized lubrication operated automatically is one of the most important new departures making for safer, more certain service for all types of operating machinery.

Important Precautions

Certain important precautions are necessary to observe in determining the amount of oil in lubricating greases, Glenn Williams and associates of Battenfield Grease & Oil Co., stated. Quick heating is absolutely necessary. If too much excess alkali is added, it remains in the sample as a cloud and is hard to remove, they said. If a low flash-point oil is used in the grease, care must be observed not to heat the sample too high, drive off the light portion, and give a deceptively high viscosity determination. Addition of dry lime to a sample of the grease and working and heating the sample carefully, followed by cooling by setting the container in cold water, will generally cause the oil to separate properly. Determining the oil in a soda-base grease ½ oz. of caprylic acid, obtainable from Armour & Co., is added to and stirred into a soda grease. It is heated to liquidity. Barium hydroxide or lime is added, and the oil filtered off. Glycerin may be added to aluminum greases along with the caprylic acid for better results in oil separation, these authors have found.

The maximum consideration to the design of any antifriction bearings must be given in order to prevent the possibility of over-greasing, W. T. Saveland, of Allis Chalmers Manufacturing Co., stated. Units running satisfactorily for long periods without maintenance are protected best by the elimination of grease equipment for filling. The more severe the service, the greater necessity for periodic grease replacement with the minimum of effort, Saveland stated.

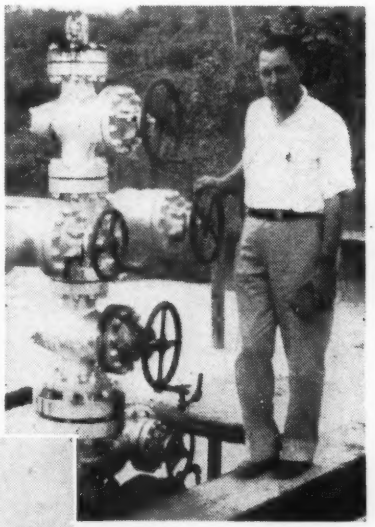
The electron microscope is proving to be one of the most useful aids in determining the composition and structure of different grease, B. B. Farrington, of California Research Corp., said. Research showed how the structure and fibers of soaps in grease vary and how the effect of operating techniques on grease structure may be analyzed and improved methods used in making better greases.

A new process for making aluminum soap greases continuously has removed many of the problems inherent in batch methods for grease making, Dr. H. G. Houlton, of Girdler Corp., told the assembled grease makers. This process has been proved in an installation making 1,500 to 2,000 lb. of grease per hour. The process operates by making an oil and soap slurry under vacuum to eliminate air from the product, is heated and then cooled in specially designed votator units. The product is worked and then packaged immediately, Dr. Houlton said. By separating the cooling and jelling operations, a much more uniform consistency of the grease may be obtained with minimum time loss. The heating stage requires 245,000 B.t.u. per hour when processing 1,740 lb. per hour. Of special importance in this process is the control of temperature so that the desired uniformity of consistency is obtained. For a given grade of grease, a transition temperature of 180° F. was found, and if the cooling temperature is maintained at that point or lower the final consistency was essentially the same with better yields.

Journalites Return from Mexican Trip

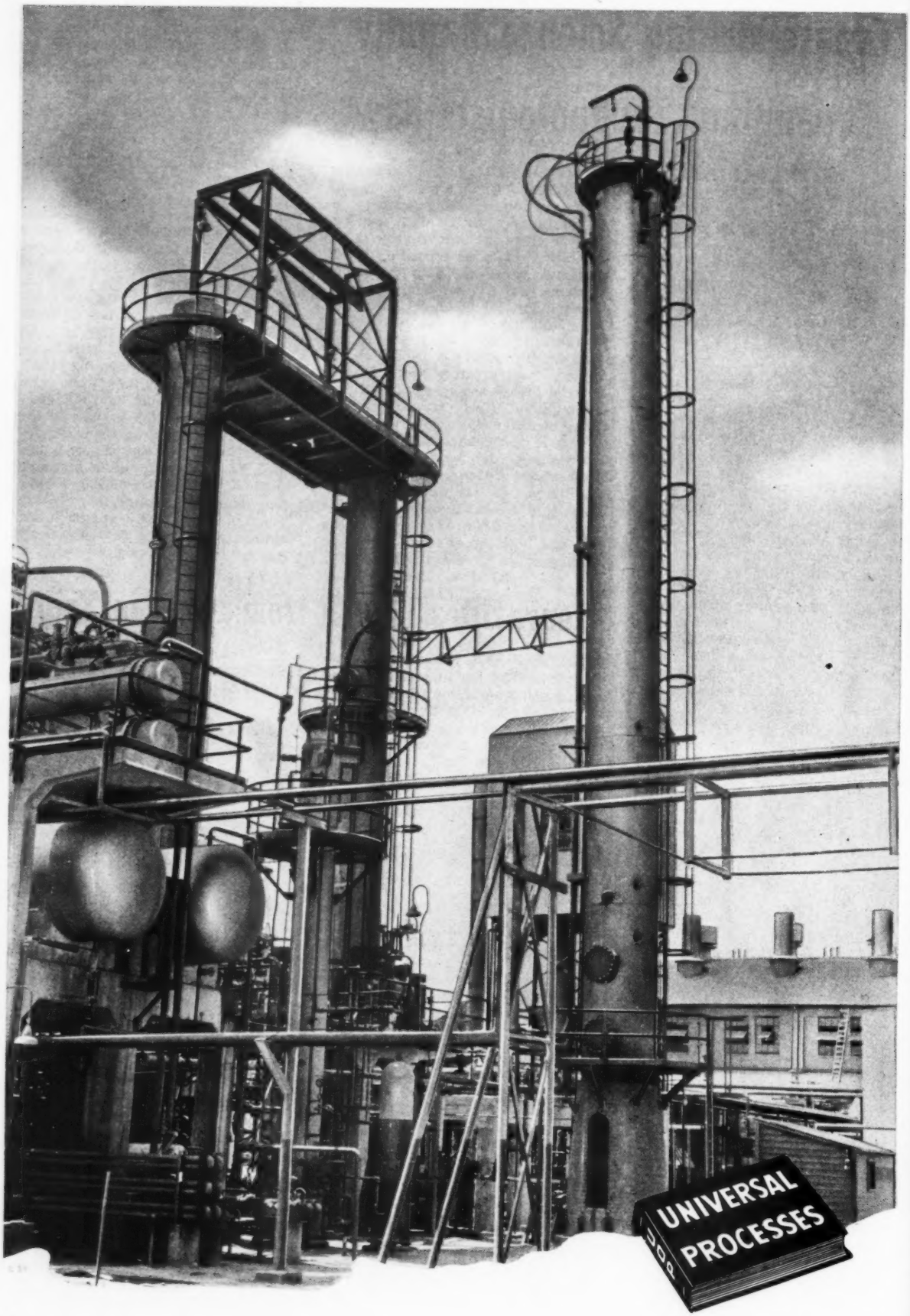
WAYNE RIVES, advertising manager of The Oil and Gas Journal and its affiliated publication, Petroleo Interamericano, and O. B. Irizarry, editor of the latter magazine, returned this week from an extended trip to Mexico. While in the Latin-American republic, they visited oil fields and refineries, as well as pipe-line installations, in the interest of the two publications. Current activities of Petroleos Mexicanos (Pemex) were thoroughly studied, and material gathered for reports which will appear in future issues.

According to Rives and Irizarry, Mexico is in the midst of a period of expansion, oilwise. Exploration activities are being intensified, with a trend toward subsurface superseding surface geology. Production in the Poza Rica field is being increased, and old fields are being reconditioned. Refining capacity is being enlarged by at least 25 per cent.



Above: Rives standing by christmas tree at the 52 Poza Rica

Left: Irizarry conferring with Ing. Alfonso Mernetche, assistant manager of production for Petroleos Mexicanos, at the latter's Mexico City office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But that's only part of the story. This unit was converted from an isomerization unit, operated by the refinery during the war in production of high octane aviation gasoline components. After the war Frontier had to consider how this equipment could be used effectively in producing for a peacetime market. An analysis by UOP engineers indicated that this unit could be economically converted into a non-selective catalytic polymerization unit. Most of the existing equipment was utilized and a relatively small investment in new equipment was required. The results speak for themselves.

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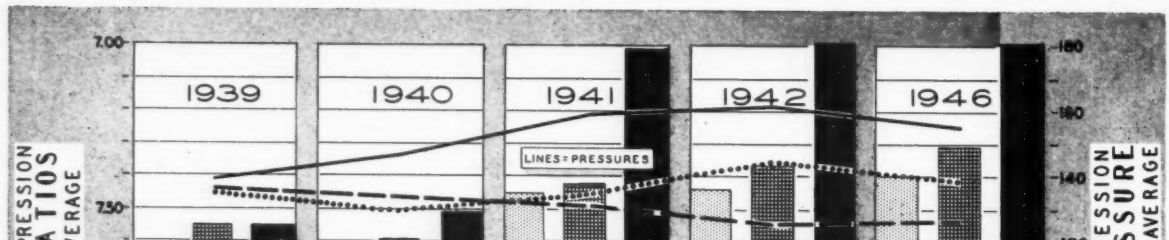


Trends in engine compression ratios and pressures, 1939-1946, in three price ranges of cars

What Kind of Fuel Will You Make In 1947? Asks Motor Industry

by Arch L. Foster

DETROIT.—The shadow of future sales competition when the market for cars becomes saturated and competitive pressure mounts seriously can already be seen when talking with prominent automotive technologists regarding prospects for requirements in fuel and lubricant properties for the new cars of the immediate future. These technologists, however, are by no means agreed as to what that industry wants or what will or should be available in the way of fuels and lubricating oils for 1947 cars.

Some automotive technologists, looking toward the same sales and service problems for the lower-priced, highly competitive cars, are leaning strongly in the direction of economy of operation, although they look to different means for accomplishing the improvement in operating costs. While the trend of compression ratios and pressures is inevitably upward, some of the fuels-lubricants specialists think in terms of little increase in these ratios, and more in terms of miles per gallon for less expensive, nonpremium-priced fuels. Others, including at least one of the largest low-priced car makers, is planning to obtain better economy by higher compression pressures for more expensive fuels or at least for fuels with higher octane ratings, and thus obtain more miles per dollar. The overall cost of travel, for the passenger-car owner, no matter how high or low the price per gallon for fuel, is the deciding factor in the customer's mind, this manufacturer believes, who will go after more power per octane number or per gallon of fuel.

Among the highest priced, "luxury liner" class of car makers, some protest has been registered against any holding down of octane rating; demands have been made that premium motor fuels be stepped up in octane rating and performance possibilities. "When one of our customers buys his new car," the chief engineer of one company building expensive cars stated, "he doesn't want economy nor is he buying for that purpose. He is buying performance, that's why he buys a ——— car. We build our engines now for a compression ratio of more than 7 to 1; we want to use 8 to 1 or 8.25 to 1 in our 1947 models; are we going to get the premium motor fuel which will give the required performance in such engines?"

This theme is echoed by other makers of superquality cars, and all indications now are that these cars, representing only a very small percentage of the total cars on the road, will require the best premium fuels available to show their maximum performance in the hands of purchasers. All of them may be expected to use ratios of the order of 8 to 1 or higher in 1947. Needless to say, the situation is still in a state of flux, and final decisions will be based on both the maker's wishes and the prospects for the quality of fuel which will be available to the customers.

In the low and middle-priced car field compression ratios are expected to go up slightly, but with no significantly large increases, informed technologists say. It is known that most of the larger fuel suppliers can boost octane ratings if and when competition and the new cars require it. Available fuels are being analyzed and tested and oil technologists are being consulted constantly in the effort to determine just what the octane and volatility levels for next year may be.

Lubes Not Serious Problem

No great drift to the use of heavy-duty, premium-priced lubricating oils for passenger cars is foreseen in the immediate future, the chief technologist for one of the largest motor manufacturers states. General trend postwar will be similar to prewar tendencies. Those car owners buying 25-cent oil heretofore will probably do the same thing in the future; those buying the highest-priced oil in the past will continue to do so, he stated. These heavy-duty oils were developed during the war especially, following the requirements for War Department 2104B specifications, which will continue to be the standard for this grade of lubricant. The use of the new classification of three grades of oil, regular, premium, and heavy duty, is essentially an oil-industry matter,

not one of great moment to the automotive people, another Detroit technologist states, and points out some of the frictions arising in various quarters on this matter. That the general, long-time trend will be toward more highly "fortified" crankcase oils practically all technologists have agreed.

To illustrate some of the problems which are arising and which, although not new qualitatively, appear to be accentuated under postwar operating conditions. A large bus company changed the brand of crankcase oil in its bus engines to the product of another company, and suddenlp developed dead engines and stranded buses. Fault was found immediately with the fuel used; more careful study by an outside engineering firm showed by operating groups of buses on both the old and the new lubricating oils and on fuels of two different lead compositions that the difficulty lay in the new oil which promoted heavy deposits sufficient to choke the engine and stop operation. Switching to the old brand of oil eliminated the trouble or reduced it to its former minimum of occurrence.

New Problems Arise

Meanwhile some old and some new problems have arisen in the operation of especially heavy-duty engines. One of the most important of these is that of heavy, gummy deposits in the intake manifold and intake valve chambers of engines. Responsibility for this increasingly important phenomenon has not been determined with certainty, nor can it be said to be traceable to catalytically cracked fuels, or a combination of these fractions with other and older products. Research has shown that comparatively large amounts of nitrogen compounds are found in this deposit. Technologists attribute the origin of these compounds to the probably increased amounts of amino organic compounds used as inhibitors in motor fuels. Whether or not these amino compounds are responsible for the deposits or are merely caught up in the mass is at present conjectural. Some engineers believe that the increased severity of cracking, mostly thermal, combined with catalytic products may be one cause of the rapid increase in this trouble. One commercial motor fuel, containing both catalytic and thermally cracked components, is one of the worst of these fuels for causing intake-manifold deposits, but the evidence against either or both sources is so far inconclusive.

Refiners Cooperating on Problem Studies

More than one group of refiners, especially smaller-capacity companies, have banded together already and are pushing research programs in collaboration with engineering and research organizations to find out how to improve motor-fuel quality without going to the more expensive catalytic cracking, but using superfractionation, thermal cracking and reforming, tetraethyl lead and any other means within their economic reach. Some of these studies are beginning to bear fruit, if we are to believe reports from trustworthy sources. At the same time strenuous efforts by research and development bodies to adapt catalytic cracking to the limitations of the smaller refiner show good likelihood of solving at least some of his problems. Intensive work toward the development of substitutes for TEL has shown some interesting results, but so far too many drawbacks have been found to permit the use of any substitutes commercially. It is obvious that with new engines, new fuels and fuel components, and new lubricants coming into the field new problems and new combinations which produce problems are inevitable, and that considerable time and much research are necessary before all these can be solved even partially.

A study of the trends shown in the tabulated data and the curves drawn therefrom brings out the fact that since 1939 relatively small increases in average compression ratios have been made in the low-priced car field, somewhat larger increases for the medium-priced cars, and much greater increase for higher-priced cars. All available information points to the probably much more rapid rise in compression ratios for 1947 and later model engines, urged on by competitive demands and made practicable by the postwar ability of the major part of the refining industry to supply fuels of higher antiknock properties. Whether or not such octane rating boost in motor fuels is to prove economical for either the refiner, the engine builder, or the automotive industry's customer remains to be determined by immediate future history.

Stratton Field Gets New Gas-Oil Ratios

AUSTIN.—The Texas Railroad Commission last week announced new gas-oil ratios for the Bertram and Warner sands of Stratton field in Nueces, Jim Wells, and Kleberg counties.

The new order sets a ratio of 8,785 to 1 for oil wells on 40-acre spacing, with additional gas produced to be returned to the formation to maintain reservoir pressure. Natural-gas wells on 640-acre spacing were given a ratio of 1,785 to 1, compared to the former ratio of 2,000 to 1. The formula for natural-gas wells is based upon 1,000 cu. ft. of gas equaling 1 bbl. of oil in volumetric displacement. In addition, each gas well is allowed 785 cu. ft. of free gas which oil wells are allowed per barrel. Excess gas must be returned to the formation.

E. O. Thompson, commission member, commenting on the new solution-ratio for the field, said the order conforms to the Bammel field case decision which held correlative rights of all operators must be protected. He said wells withdrawing gas from the gas cap are allowed the same production, on a volumetric-displacement basis, as the oil wells farther from the field's center.

"We have gradually been working the gas-oil ratios down in Texas," Thompson said, "and the state-wide ratio now is 2,000 cu. ft. per barrel of oil. Solution ratio is the irreducible minimum. The commission's action should indicate a trend. We have treated this reservoir just like the engineers said it should be treated, in requiring the return of gas to the crest of the gas cap."

October daily gas well allowables announced were (in cubic feet): Carthage, 329,580,000; Rodessa, 22,872,580; Whelan (Harrison County), 10,645,161; Sipe Springs (Eastland and Comanche counties), 1,322,581; and Alief (Harris County), 6,774,193.

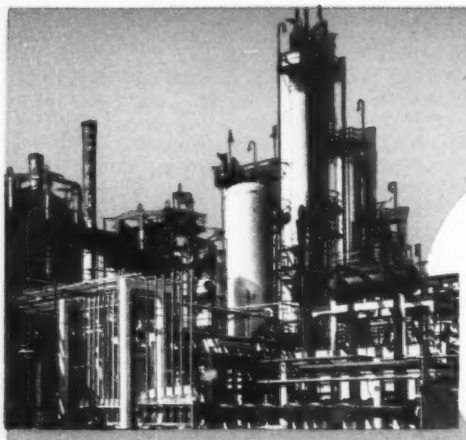
Other recent actions of the Texas commission included disapproval of a gas-proration plan submitted by Lone Star Gas Co. for Carthage field of Panola County, reduction of the oil-allowable bonus for salt-water injection in East Texas, and notice of a hearing on maximum well allowables in the Panhandle pool.

Lone Star Gas proposed allocating gas runs on an annual basis because of fluctuating demand. Underproduction would be accumulated in periods of high demand, and overproduction would be permitted to six times the monthly allowable.

The commission took the position the increased price of crude will compensate operators for the reduction in the East Texas oil bonus. Under the new order, an extra barrel of oil is allowable for each 60 bbl. of salt water injected instead of 50 bbl.

The Panhandle pool hearing will be held October 24 to determine if wells are capable of making more than the present 40-bbl. maximum. The commission at the same time will study gas utilization in carbon-black manufacture to determine if there is preventable waste.

In Oklahoma, the Corporation Commission was involved last week in the question of gas production in the Guymon-Hugoton area. The commission heard the contested application of Republic Natural Gas Co. for reinstatement of underproduction in the first 5 months of 1945. A decision in the case is not expected for weeks.



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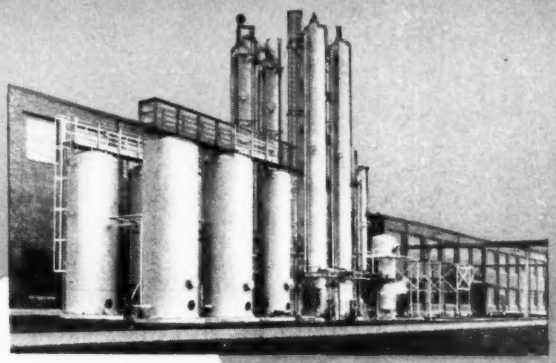

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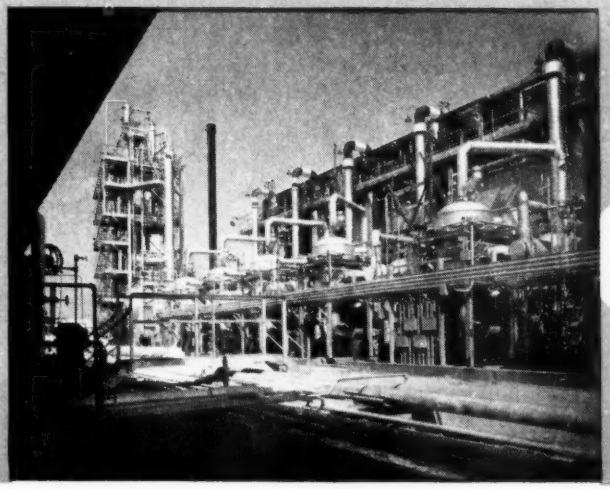

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Desulfurization, Reforming Add Octane Numbers to Motor Fuel

by Arch L. Foster

WICHITA, Kans.—Desulfurization of naphtha stocks and their catalytic reforming are two processes which offer the refiner means for adding several octane numbers to his motor fuels, Dr. M. W. Conn and G. M. Brooner, of Perco Division, Phillips Petroleum Co., told the technologists of Western Petroleum Refiners Association here in a district meeting September 26. This improvement is made possible by both the increase in octane rating of desulfurized stocks, per se, and by their greater tetraethyl lead susceptibility, Dr. Conn said.

Also, the onerous problem of disposal of waste waters, such as that produced with crude, may be solved so as not only to remove the water as a disposal problem but to give the refinery an additional emergency supply of plant water, C. G. Rook, Jr., of the Talco Division of American Liberty Oil Co., explained. By a proper sequence of three treating steps, Rook showed how this water may be "cleaned up" to remove troublesome dissolved materials and may be impounded for use as make-up water during the dry summer months of the year in Texas or other areas where water supply may become a serious problem.

Desulfurization Process Outlined

The desulfurization process outlined by Dr. Conn and Brooner includes essentially the treating of the sulfur-bearing naphtha with a catalyst at elevated temperatures up to as high as 790° F. reactor-outlet temperature. The resulting improvement of straightrun stocks shows a clear octane number gain of 2 to 4, and an improved TEL susceptibility with 3 cc. of as high as 8 A.S.T.M. numbers. Thermal reforming of the desulfurized and undesulfurized naphtha shows a gain of one or two octane numbers in the reformed desulfurized material. Catalytic reforming at temperatures of 1010° to 1030° F. increases octane ratings by 8-10 A.S.T.M., on the unleaded product and 10 to 12 numbers increase with 3 cc. TEL, Dr. Conn stated. Regeneration of the catalyst is carried out by admitting air and steam, the latter as diluent, in the ratio of about ⅓ lb. of steam to 1 cu. ft. of air, to burn off the carbon on the catalyst. The capacity of the regenerating equipment designed for this reforming operation is not sufficient to handle the regenerating load when cracking gas oil in the reformer unit, Dr. Conn said.

Preliminary researches have shown that a 23 per cent fraction of Wyoming crude, treated with a bead catalyst, shows a clear octane number improvement from 50.4 to 55.6, according to Robert M. Cornforth, of Houdry Process Corp. The A.S.T.M. octane number of this product is raised to 74.9 by 3 cc. TEL, whereas the same amount of TEL raises the octane number of the charge or untreated stock to only 67.6, Cornforth said. In treating a blend of 40 per cent thermally cracked stock and 60 per cent of straightrun naphtha the sulfur was reduced from 0.70 per cent to 0.20 per cent, it was reported. These experiments are in their earlier stages, Cornforth stated, and are being continued.

By a three-step treating process, the pH of waste water from crude production is reduced from 11.6 to 7.4. Rook stated. Turbidity of 1,000+ is reduced to less than 50 by the process while the odor is improved from very bad to good. The chlorides and sulfates are increased considerably by the treatment.

Water First Neutralized

The process consists of first neutralizing the water with sulfuric acid to 7.0 pH, which aids in demulsifying the oil in the water. Next ferrous sulfate is added which precipitates the sulfides as iron sulfide. Chlorinated lime, prepared by introduction of chlorine to lime slurry, is next added to precipitate the iron as the hydroxide, which flocculates the suspended matter to clarify the water; the chlorinated lime contains 15 per cent chlorine. The water is allowed to settle for a considerable time in a large, earthen pond, from which the clear water overflows to a storage tank alongside.

So long as the pH is held at about 7.4, Rook stated, the high sulfate content will remain in solution without giving trouble. No advantages are obtained by heating these reactants, he said; the reductions go as well or better at atmospheric temperature as at elevated temperatures. This system eliminates the danger of stream pollution from oil, one of the pollution agents to which Texas fish and game authorities object, Rook observed.

A.P.I. Sets Up Achievement Award

WASHINGTON. — Creation of an "Oil Oscar," an "American Petroleum Institute Award for Distinguished Achievement," to be presented annually to the person who has done the most for the petroleum industry, was included in business transacted at the quarterly meeting of the A.P.I. board of directors here September 25.

The board also voted to offer directorships exofficio to the presidents of two additional trade associations, the California Stripper Well Association and the Atlantic Coast Oil Conference. In another action the general committees of the A.P.I. were enlarged from 40 to 50 members each. There was discussion of appointment of a head of the marketing division, a post recreated nearly a year ago, but no decision was made, though it was decided to house the marketing division in the Washington office when established due to crowded conditions in the New York headquarters. The program for the annual A.P.I. convention in Chicago November 11-15 was also discussed.

Much of the meeting was devoted to a discussion of the impending sale of the big-inch pipe lines by War Assets Administration and the economic effects on the oil industry if they are used for petroleum movement. No action was taken by the A.P.I. directors, but it was the general feeling that the WAA should be informed of the industry's views as presented by a special committee before the Senate petroleum-resources committee last November.

Standing Committee Created

The board created a standing committee of nine who will select each year a man or woman in the petroleum industry who, in the opinion of the committee, throughout the years has made outstanding contributions to the arts and sciences or administration of the petroleum industry. The committee also may select, from time to time, at its discretion, a similar honoree outside the petroleum industry who has contributed to its achievement.

Either one or two awards may be made annually, or none, if the committee finds no one it chooses to honor. The presentations are to be made at the annual A.P.I. meeting by its president. Chairman of the awards committee is John M. Lovejoy, Seaboard Oil Co. of Delaware.

WASHINGTON WATCHING

BY HENRY D. RALPH

An Unenthusiastic Council

WASHINGTON.—As far as outward appearances go the National Petroleum Council got off to an auspicious start last week.

The council adopted a resolution saying it could serve a useful purpose, agreed on a plan of operation, appointed committees, and started work on some assignments. There was a fairly good attendance and very little dissension.

But under the surface there was not much enthusiasm. The prevailing attitude was that they would "go along" with the Interior Department's request for a functioning organization, giving the department advice when asked for it.

Some members are predicting that future meetings will draw smaller and smaller attendance until the council dwindles down to a handful of the faithful and after while they may tire of interrupting their work to come to Washington at their own expense. Apparently Ralph Davies sensed this feeling and attempted to arouse interest by suggesting an agenda of half a dozen immediate problems on which the members could go to work. It may be significant that the council decided to take up only three of his six topics at this time.

One member moved that the council hold its next meeting in 1949 and meet every 4 years thereafter, a proposal which would reduce NPC to a status just below that of the Electoral College, but the motion was treated with silent contempt and died for want of a second.

Antitrust Hobbles NPC

LIKE the King of England who can do no wrong because he can't do anything at all without the consent of Parliament, the National Petroleum Council is not going to violate the antitrust laws. The plan of procedure is chuck full of safeguards.

In the first place, the council won't discuss anything unless requested in writing by the Interior Department, and it reserves the right to decline such requests if it desires. Industry lawyers will sit in on all deliberations, and with the antitrust laws uppermost in their minds at all times. Everything will be in writing and filed with the Government, public notice will be given of all meetings, and government officials may attend all committee meetings. Criticism and minority views will be incorporated into the minutes. Committees will be dissolved as soon as their specific assignments are completed. Trade practices are specifically barred as a topic of discussion.

Thus the council has limited itself to a field far more circumscribed than the ordinary trade association, though it might be expected to have somewhat more freedom of action than a voluntary trade association because it was created at the request of the Government. The explanation, of course, is the peculiar degree of attention the council has had from the Department of Justice.

This interest goes back to the Madison oil case where a large part of the industry was prosecuted for continuing practices formerly demanded by the Government under the NRA code, and was heightened by the fact that during the war the Government gave specific antitrust immunity to many agreements worked out by industry advisory committees. Correspondence with the Justice Department during recent months has sharpened the issue.

So both the Government and the industry are keenly aware of the possibility that antitrust violations might grow out of this sort of government-industry cooperation, and both are very much on guard. After all this formal warning, the department could hardly be expected to wink at a minor infraction or accept a plea that a violation was inadvertent.

A.P.I. Talks Over Big Inch

THE prospect that War Assets Administration is preparing to sell the two big-inch pipe lines for common carrier movement of crude oil and petroleum products was the chief topic of discussion at the quarterly meeting of the A.P.I. directors here last week. All agreed that somebody ought to do something about reiterating the industry's opposition, but no action was taken.

If anything is done the task apparently will fall on W. Alton Jones, president of Cities Service Oil Co., who was chairman of a large industry committee which reported on postwar disposal of government transportation facilities at hearings before the Senate petroleum resources committee last fall. This committee was appointed by the presidents of five trade associations and presumably it could reconstitute itself for the purpose of restating the previous position to WAA, which was not in existence at that time.

This committee agreed that use of the big-inch lines for oil in peacetime would disrupt the economy of large segments of the industry, and recommended that they be maintained in standby condition for future military use or else converted into gas lines. A special committee of independent oil men took an equally firm stand, particularly against their use to deliver oil into the interior sections of the country.

WAA's utility section staff is still studying the various bids for purchase of the lines, several of which propose to use them to move oil into the Ohio Valley region. The staff report will be sent to various other government agencies and congressional committees for comment, and before final action is taken the recommendation will clear through two or three review boards within WAA. This procedure may take several months and should provide opportunities for the oil industry to express its views. However, probably nothing will be done until the WAA staff report is completed.

Insufficiency of Soviet Oil

RUSSIAN oil production will be insufficient for domestic needs for the next dozen years or so in the opinion of E. C. Ropes, Soviet expert of Commerce Department, who just returned from 6 weeks in Moscow.

While he was not primarily concerned with oil and did not visit any oil fields or refineries, Ropes obtained the impression that Russia is very short of oil and that the facilities overrun by the Germans have not been rehabilitated for the most part. He believes that Russia will need scores of millions of dollars worth of oil-industry equipment in the next few years and that the Soviets will not be entering the world's oil export field any time in the near future.

The Commerce official was particularly interested in reviving the prewar exchange of statistics and trade information, and obtained promises that such data will be sent out of Russia as soon as its compilation is again published there. Soviet officials pointed out, however, that their industry suffered great damage from the war and is still in the process of reconversion and reconstruction. He reported that Soviet officials are interested in reviving trade with the United States and favor holding conferences with American industrialists on technical problems of industrial development and economic cooperation.

13 DIFFERENT INTERNATIONAL MODELS IN THIS FLEET OF 65 TRUCKS

• The L. C. Jones Truck Co. of Oklahoma City hauls oil field equipment.

And hauls it with International Trucks.

Thirteen different International Models are represented in the Jones' fleet. Smallest is the International K-2 for pickups. Largest is the International KR-11 to haul big stuff.

Note how the *complete* International Line gives the L. C. Jones Truck Co. a model for each type of hauling.

But the fact that the *complete* International Line offers a truck of the right size and power for every job is only one International feature.

Other features add up to *performance*—and the performance of International Trucks—the reliability, long life and economy—is so outstanding that for the last 15 years more heavy-duty Internationals have served American commerce and industry than any other make.

Back of International Trucks are service facilities as outstanding as the trucks themselves, available everywhere from International Dealers and International Branches, the nation's largest company-owned truck-service organization.

Motor Truck Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL TRUCKS

Meeting Steel Requirements the Hard Way—

But Still Meeting Them!

A manufacturer of coal mining drills was desperate for 2½" x 2½" x ¼" square tubing needed for drill supports, on an order scheduled for shipment halfway around the world. The required size of tubing was nowhere available, but Ryerson Steel Service was equal to the occasion.

By forming two channels from ¼" plate and welding the channels together we were able to deliver several hundred pieces of the required tubing! While such an emergency measure is obviously not always practical, it did make it possible for the customer to complete his order and ship on schedule. And this is but one of numerous instances where Ryerson service has achieved the seemingly unachievable.

There are many requirements that we cannot handle today, but it is often surprising what can be done with the close cooperation of your nearby Ryerson plant. If needed steel is out of stock the Ryerson salesman will sometimes be able to suggest a practical alternate steel, or he may know a way in which flame cutting, forming or welding can serve to provide a workable substitute.

So we urge you to keep in touch with us. Our whole organization is doing everything within its power to help every customer get the steel he needs.

JOSEPH T. RYERSON & SON, Inc., Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston

RYERSON STEEL

Burning-Oil Market Stiffens in Mid-Continent

FIRST indications of a strengthening of the Mid-Continent burning-oil market in advance of winter consumption occurred last week, while motor fuel generally continued to move unchanged at generally prevailing prices.

Some major companies were reported to be buying burning oils on the spot market. This activity, similar to the heavy interrefinery buying of gasoline through the summer, was stiffening the price of the burning-oil group of products. Further strengthening is due as soon as colder weather requires northern jobbers to begin drawing heavily on storage.

In the Mid-Continent area, gasoline prices continued to range around 6⅞ cents with some under-the-market material offered fractionally lower. Demand was good in natural gasoline and in Oklahoma, some suppliers early this week quoted 4¾ cents for the 26-70 grade, but the low quotation remained at 4½ cents.

Rising burning-oil stocks and falling motor-fuel inventories continued to feature the stock pictures in the week ended September 21. Total stock gain in the burning-oil group was reported at 3,093,000 bbl. Gasoline stocks fell from 86,818,000 bbl. to 85,854,000 bbl. Crude stocks were up 761,000 bbl. to 222,664,000 bbl.

Department of Commerce figures for August showed sales of independent filling stations 28 per cent higher than August 1945 and 4 per cent higher than July 1946. General Motors reached a new high in passenger-car production in the September 21 week, turning out 27,374 units, but GM's total output for the year was still running more than a million units behind 1941. September 1 service-station gasoline prices, as reported by The Texas Co. and furnished by A.P.I., reflected the August tank-wagon increases following the general crude price advance. The 50-city price averaged 21.60 cents, an increase of 0.43 from the previous month.

Triple Anniversary Marked By Oil City Derrick Edition

Of interest to the oil industry, particularly from a historical standpoint, is the recent publication of the Seventy-Fifth Anniversary Edition of the Oil City, Pa., Derrick, which commemorates the triple anniversary of the founding of the newspaper, the city, and the Oil City Trust Co.

The 134-page, 8-section edition carries letters of congratulations from President Truman and Edward Martin, Pennsylvania's governor, on its front page. It features numerous articles and pictures dealing with the history of the city and the newspaper and development of the Pennsylvania-area oil industry with which both Oil City and the Derrick are closely associated.

The Derrick was published by P. C. Boyle for 35 years prior to his death in 1920. Boyle, who worked in early-day Pennsylvania fields following the Civil War, established The Oil and Gas Journal in 1910. Edward P. Boyle, his grandson, is the present publisher of the Oil City Derrick. In the anniversary edition, the Derrick announced plans for the construction of a new building, the third in its history.

Oil City itself resulted from state approval of a merger of an Oil City town area and Venango City March 9, 1871. Located at the point where Oil Creek empties into the Allegheny River, the city was an important link in the oil-barge system. Several early Pennsylvania wells were located within the city area in the 1860's. Oil City became one of the first prominent oil communities in Pennsylvania and has retained its status through the years.

Petroleum Safety Group to Meet in Chicago

Oil-company safety experts will meet in Chicago October 7 for a 4-day program on petroleum-industry accident prevention held with the thirty-fourth National Safety Congress and Exposition.

The American Petroleum Institute's central committee on accident prevention will meet Monday morning, October 7. The program of the petroleum section of the safety congress opens Tuesday and continues through Thursday. Officers of the section will be elected. Talks scheduled deal with safety measures in various branches of the industry and ways of educating employes on safety.

Sloan & Zook Co. Sells Kane Area Properties

BRADFORD, Pa.—Oil property including 1,264 acres and 66 producing oil and gas wells in the Kane area in northwestern Pennsylvania has been sold by Sloan & Zook Co., Bradford, to Bomac Oil Co.

The Bomack company is composed of H. A. McKenna, James S. McKenna, and V. V. Bowman, all of Kane. It was reported the purchasing company plans further development by drilling additional wells and by repressuring.

Sloan & Zook has operated the producing property for the last 32 years in connection with its gasoline plant at Kane which manufactures liquefied petroleum gases and other products. A Sloan & Zook official said the manufacturing section of the company will be dissolved with the sale of the properties and shut-down of the plant. The company, he said, has found it less expensive to buy and market finished products rather than continue manufacturing.

DEATHS

James B. Porterfield, 81, who had been associated with United Natural Gas Co. 33 years prior to his retirement in 1925, died September 24 at Oil City, Pa. He previously was with Oil City Fuel Supply Co. and has served as assistant superintendent of Wabash Natural Gas Co.

Levi Garret, 95, independent oil operator, died September 23 at his home near Magnolia, Ark. At the time of his death he had 15 producing wells and in 1938 owned the property on which Magnolia oil field was discovered.

Theodore R. Gaethke, purchasing agent for Bovaird & Seyfang Manufacturing Co., died September 22 in Bradford, Pa. He had been associated with the company the last 40 years.

George E. Read, 64, director of Calumet Refining Co. and manager of its Cleveland, Ohio, lubricating-oil compounding and blending plant, died September 22 in Cleveland. He had been with the company 25 years.

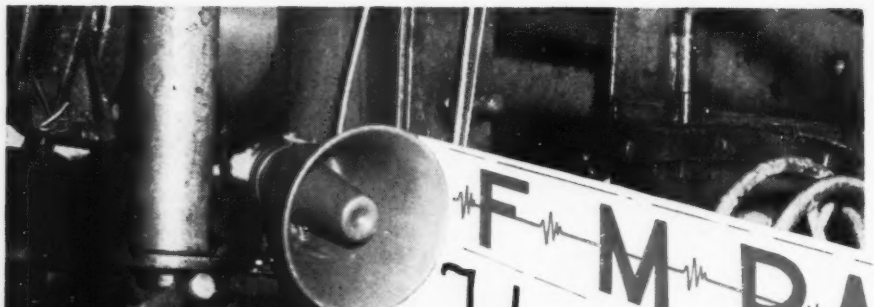
James Sanson, 71, retired oil and gas inspector for the Ontario Department of Mines, died recently at London, Ont. He formerly had been associated with Anglo-Persian Oil Co. and served in Egypt and Venezuela.

Kirk Ramsey, 62, associated with Magnolia Petroleum Co. for 29 years, died September 24 in Corsicana, Tex.

Adolph J. Winther, 66, Los Angeles, active in the earlier development of southern California's oil industry, died last week. He was drilling superintendent for several major companies and operated independently for a time until blindness forced his retirement 11 years ago.

Emmett Lee Talman, 67, pioneer independent oil operator, died September 28 in Tulsa. He began his business career in Pittsburgh and came to Tulsa in 1914 as one of the owners of Beaver Oil & Gas Co.

Robert Pierce Tobin, 73, retired chief lubrication engineer of Socony-Vacuum Oil Co., Inc., died September 26 at his home in Maplewood, N. J. He had been with the company 37 years prior to his retirement in 1939.



A loudspeaker at the driller's position on the rig floor can be heard above rig noise from any position on the location

F-M RADIO Takes to the Oil Fields

by George Weber

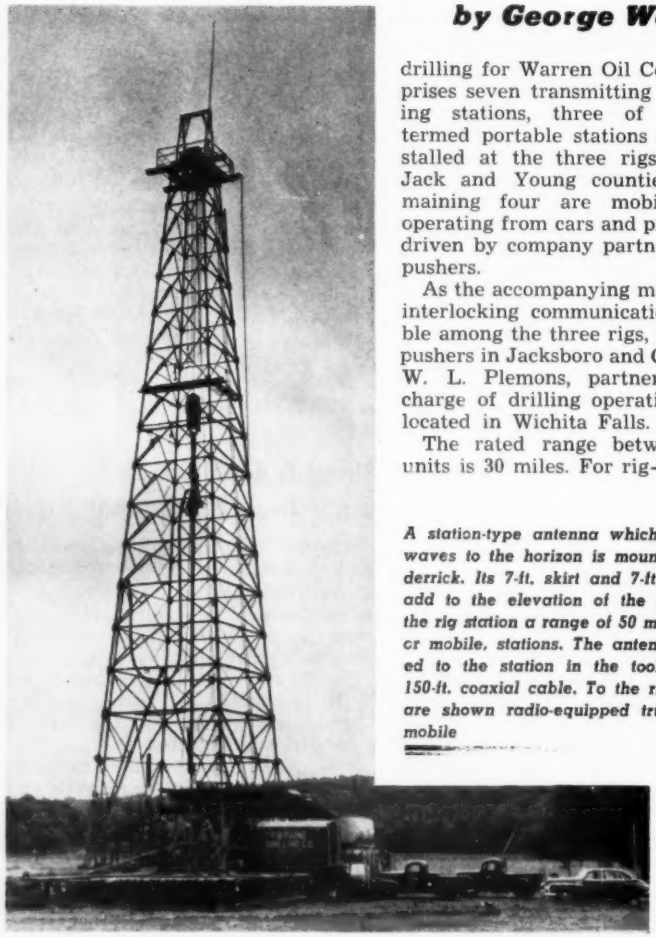
TWO-WAY FM radio communication, highly developed in wartime usage, is now arousing widespread interest in the oil and gas industry. Already employed in pipe-line dispatch systems and oil-company field operations, its latest application is a network recently licensed to F. B. Paine Drilling Co. of Dallas. This is the first such license issued by Federal Communications Commission to an oil-well drilling contractor. Pioneers in this new phase of oil-field communications are operating networks on a provisional or temporary basis, and permanent adaptation of the new tool must wait reallocation of frequencies and final FCC decision as to exactly what channels shall be made available for such purposes.

As a time and labor saver, the new system is highly regarded by drillers, tool pushers, and partners of the contracting company. The advantages of continuous contact in reporting drilling operations, calling for parts and services, and disseminating instructions or other information are obvious to anyone familiar with oil-field work, particularly when it is carried on in remote or inaccessible locations. Since the network has been in operation only a month in a comparatively compact area served by good roads, the company has only begun to realize its worth. To date, however, the saving in rig down time alone, that is attributable to the radio system indicates a payout period of about 6 months.

The network blankets several counties in North Texas where the company currently operates three rigs drilling for Warren Oil Corp. It comprises seven transmitting and receiving stations, three of which are termed portable stations and are installed at the three rigs drilling in Jack and Young counties. The remaining four are mobile stations, operating from cars and pickup trucks driven by company partners and tool pushers.

As the accompanying map indicates, interlocking communication is possible among the three rigs, the two tool pushers in Jacksboro and Graham, and W. L. Plemons, partner in direct charge of drilling operations, who is located in Wichita Falls.

The rated range between mobile units is 30 miles. For rig-to-car com-



A station-type antenna which directs radio waves to the horizon is mounted atop each derrick. Its 7-ft. skirt and 7-ft. whip further add to the elevation of the derrick giving the rig station a range of 50 miles to ground, or mobile, stations. The antenna is connected to the station in the tool house by a 150-ft. coaxial cable. To the right of the rig are shown radio-equipped truck and automobile

munication, the 140-ft. elevation of the rig antenna increases to 50 miles the line-of-sight range peculiar to frequency-modulation transmission. Range between rigs is even greater, and the network would operate effectively by direct and relay communication over a much greater area of drilling operations than the present one.

The three portable stations and one mobile unit are assigned specific call letters; KBKH, KBKN, KBKM, and KBQT respectively while the other three mobile stations share the fifth call signal—KBKQ. All stations operate on a common frequency of 37.14 megacycles. Since the frequency is crystal controlled, no tubing is required and sets are equipped only with volume control and squelch which is seldom used.

Receiving sets remain on the air continuously. No signal is necessary, since the static-free silence of the network is broken only by voice transmission. A separate receiver, located at the tool pusher's bedside, permits him to receive messages at night and to transmit by extension of the handset from the mobile unit parked outside his window.

Standard Equipment Employed

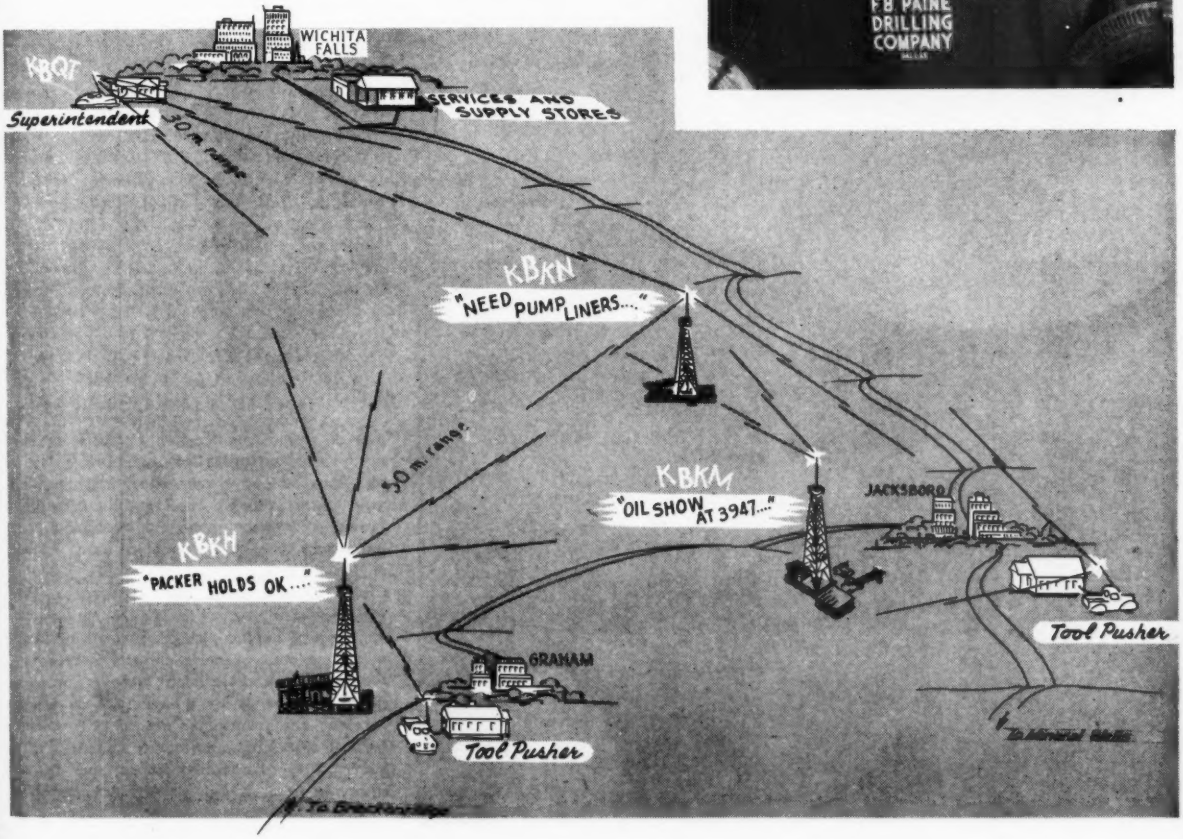
All radio sets of the network are identical with interchangeable parts. Each consists of a 60-lb. General Electric MC-1 combination receiver-transmitter, rated at the maximum authorized power of 30 watts. At the rigs the stations are powered by a standard generator equipped with a voltage regulator and driven by a v-belt from the fan belt hub of one of the prime movers. A 200-amp., 6-volt storage battery permits the station 30 hours of standby operation during rigging up and tearing down when power generation is not possible. A speaker located at the driller's position on the rig floor has sufficient power to provide readability over rig noise to all parts of the location. Transmitter and receiver are installed in the tool house.

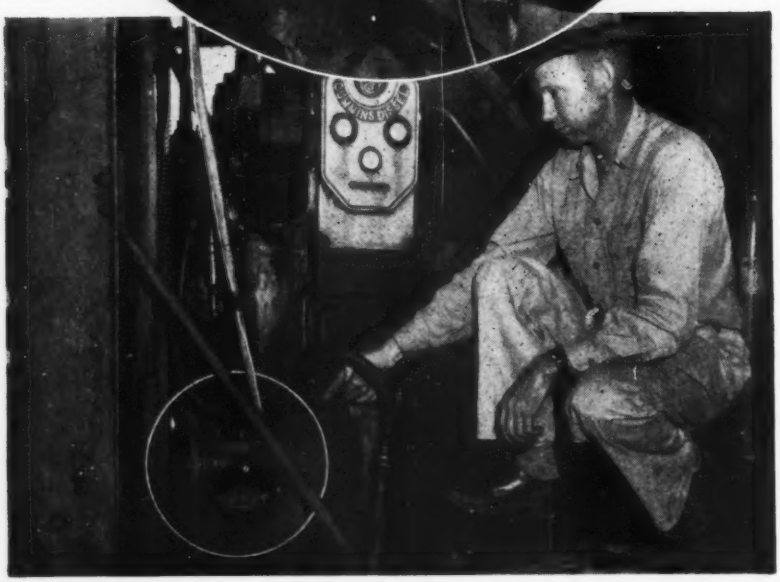
Simplicity of installation extends to the mobile units which operate on the standard 6-volt electrical system. The units may be installed in the rear of the vehicle with control panel, handset, and speaker placed on the dash, within easy reach of the driver. The mileage which oil-field vehicles average is sufficient to generate all of the power required under ordinary conditions of radio operation, precluding the need for oversized car generators and batteries. The receiver drains 8 amp., less than the average car radio, and the transmitter, used only intermittently, takes 26 amp. Completely installed, the seven-station network cost approximately $4,000.

Oil-field radio communication has long been a dream of F. B. Paine,

Right: Toolpusher Eddie Plemons demonstrates operation of the radio in his pickup truck. Receiver and transmitter units are installed in a weatherproof case in the truck bed

Below: This is the F. B. Paine Drilling Co.'s new radio "spread" shown schematically in its actual working layout in North Texas





senior partner of the company, so when equipment became available after the war, the company promptly took measures to adapt it to its needs. The period of application, approval, installation, and testing consumed about 4 months. Since this was the first license of its kind to be issued, approval from FCC involved more time than might be expected for subsequent cases.

The renewable license for each station is issued for a period of 1 year. It states: "In accordance with Section 11.123, this station is authorized to communicate with other provisional stations primarily for transmission of communications pertaining to the safety of life and property; and secondarily for transmission of essential communications in connection with drilling and other operations in the petroleum industry."

Network May Be Moved

There is no restriction to moving portable stations installed on the rigs. The governing agency requires only that in case stations are moved from one FCC district to another, the communications inspector in charge of the respective districts shall be notified prior to the move if practicable, but in any event not later than 48 hours thereafter. District No. 10 in which the network presently operates embraces Oklahoma, New Mexico, and Texas, excluding the Gulf Coast sector.

A recent ruling, FCC Order No. 133, eliminates the need for licensing operators on systems employing frequencies exceeding 25-megacycles. It requires, however, that one man employed by the company hold at least a second-class license. He is placed in charge of network maintenance and is required to check frequencies periodically to make certain that they do not vary beyond the allowed frequency tolerance of 0.01 per cent. Operators in the "Paine" network use one anothers' first names in transmissions and follow the required radio procedure of identifying their stations when signing off. A log of messages

(Continued on page 103)

Top of page: The compact portable station occupies a corner of the tool house at each rig. Above the 30-lb. transmitter and receiver units is the 200-amp. storage battery which provides standby power for 30 hours during rig-up time. J. D. Lankford is a driller on No. 2 rig

Circle: Control panel and handset are installed within reach of the driver. The speaker, located behind the dash, transmits all messages sent over the network. Between the volume and squelch controls on the panel are two lights which light up when receiver and transmitter are in operation

Left: A standard generator mounted on the substructure of a prime mover and driven from the fan-belt hub powers the portable station at the rig

Shell Runs New

WELL-SCREENING DEVICE

The author, assistant chief engineer for Shell Oil Co., Inc., is an authority on rotary drilling technique and practices. Readers will remember his series of articles on modern rotary drilling practices and equipment which was published in the Journal during the summer of 1945. Crake was born at Bulawayo, Southern Rhodesia, South Africa. He was awarded a degree in electrical engineering (first class honors) by Loughborough Engineering College, Leicestershire, England. He has been in the oil business since 1927, most of the time with his present company.

by W. S. Crake

SHELL OIL CO., INC., has in operation a new well-screening device which has considerable possibilities for screening of new wells in open hole, for gun-perforated wells and in rescreening of old wells.

The device, developed by Shell, and diagrammatically illustrated in Fig. 1, chiefly consists of a fully enclosed wire-wrapped screen which is run into the well in an oil or grease filled case to avoid damage to, or mudding up and clogging of, the screen while going in the hole. The device, which is suspended on a washing-type shoe, carries a delayed-action liner hanger and packer on the top portion of the enclosing case.

The well is washed with water to bottom with the entire assembly, to be sure the well is clean to the final shoe-setting point. This washing operation is carried on until the well is free of liquid mud at bottom and, if desired, until the well shows signs of life, at which time at least part of the mud filter cake is probably dislodged.

Washed In "Clean"

The entire assembly is then raised to the hanging point, the liner hanger is engaged against the casing and enough weight is applied to the assembly to shear the upper pin which holds the device in a telescoped position. The screen is then lowered out of its oil-bath case in a perfectly clean condition into a well free of mud until it is fully extended, where it latches into a locked position. Continuous washing is maintained during this time.

When the well is considered sufficiently well washed in, additional weight on the tool shears the pins on the liner-hanger slip bowl and the packer is collapsed, thus sealing off the device.

The tubing is then disconnected from the shoe by simple right-hand rotation and picked up to the desired hanging posi-

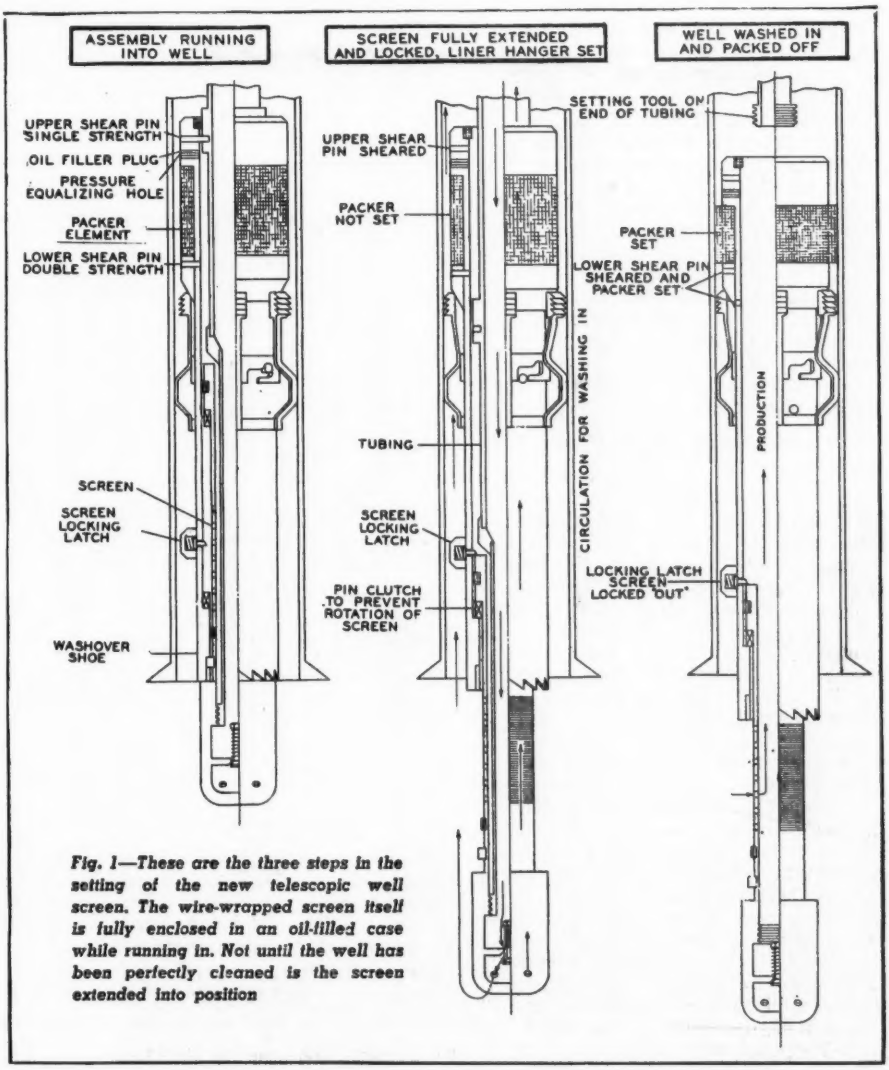


Fig. 1—These are the three steps in the setting of the new telescopic well screen. The wire-wrapped screen itself is fully enclosed in an oil-filled case while running in. Not until the well has been perfectly cleaned is the screen extended into position

tion, and the well is then placed on production.

One of these devices was successfully installed by Shell's South Texas division in 1 Houston National Bank Co. in the Placedo field, Victoria County, Texas.

The producing sand in the field is the Heterostegina of which a representative screen analysis is as follows:

B. & S. screen No.	Size opening (in.)	Per cent retained
30	0.0232	0
40	0.0165	Trace
50	0.0117	0.4
60	0.0098	1.9
70	0.0083	3.5
100	0.0059	15.1
140	0.0041	42.4
170	0.0035	10.8
200	0.0029	7.3
200+	.....	17.8
Loss	.....	0.8
Total		100.0

In some wells in the field, as many as three rescreening jobs have been necessary and the majority of screens have been of 0.014 gage, which is too large to provide effective screening.

Considerable sand trouble has been experienced with the well pumps which are in use in almost every well in the field.

The above sand analysis indicates that a 0.010-gage screen is the maximum size which can be expected to make an effective job of preventing sand entry into the wells whereas an 0.008-gage screen is most desirable. As with many other fields where similar conditions exist, it has been found almost impossible to run a screen of the required fineness in a well through mud and then to be able to clean the screen. The result is almost invariably a job which rapidly cuts out.

Smaller Gages Can Be Used

The designers of the new device believe that, regardless of the conventional washing method used, it is impossible to run a fine screen through mud without causing clogging of the screen. The clogging material, as evidenced by innumerable recovered cutout screens, does not become removed by well action in most cases and causes excessive localized velocity through the screen and consequent screen failure.

If the screen, however, is taken to bottom enclosed in a case, and the bottom of the well washed free of mud and possibly filter cake before the clean screen is exposed, the designers claim that the screen should perform as designed and give long and trouble-free life.

Furthermore, it is believed that due to the cleanliness obtainable on this type of job, setting of screens of as low gage as 0.005 may become quite feasible where needed and that the smaller diameter screens necessitated by enclosing will be far more effective than conventionally installed, larger diameter screens.

The well in question was completed as a screened open-hole producer some years ago and the original 5-in. o.d., 0.014-gage screen was replaced later with 3½-in. o.d. 0.012-gage screen set inside the original 5-in. o.d. screen which had been thoroughly washed with a screen-cleaning tool. This latter screen had been in the well only about 3 months when it failed, and upon pulling the assembly, a ¾-in. hole was located in the screen 5 ft. off bottom.

The telescopic screen, using 0.008-gage 2⅜-in. o.d. stainless steel wrapped screen inside a 4-in. o.d. outer case, was run in the well and set inside the old 5-in. o.d. screen which had again been thoroughly washed. The shoe of the new screen was set 1 ft. above the indicated hole in the outer screen. A conventional canvas packer and slip liner hanger was used to suspend and pack off the assembly. No trouble was experienced in setting the screen and the liner-setting tool was removed prior to reinstalling the 2½-in. tubing and production pump.

The above operation was conducted with salt water in the well, mainly as a method of proving the mechanical design and handling of the new type screen. It is felt that there is now good reason to believe the screen should give the expected results in a mud-laden well if properly washed.

Another interesting feature of the device is that the shoe of the outer enclosing case is equipped with cutting teeth. When recovering the device, the packer can first be cut off, and removed, and the case can then be rotated down over the screen as a washover tool, as shown in Fig. 2. This feature should facilitate removal of the assembly from the well when necessary. Patents Nos. 2,359,710 and 2,359,717 have been granted to Shell on this device.

Rangely Plant Proposed By Alexander, Roberts

RANGELY, Colo.—Construction and operation of a natural-gasoline and repressuring plant has been proposed to operators in the Rangely field by a corporation headed by Otis A. Roberts, Denver, and Clyde Alexander, Dallas, according to reports here.

The plant under consideration would cost approximately $3,500,000. Alexander is a former vice president of Phillips Petroleum Co.

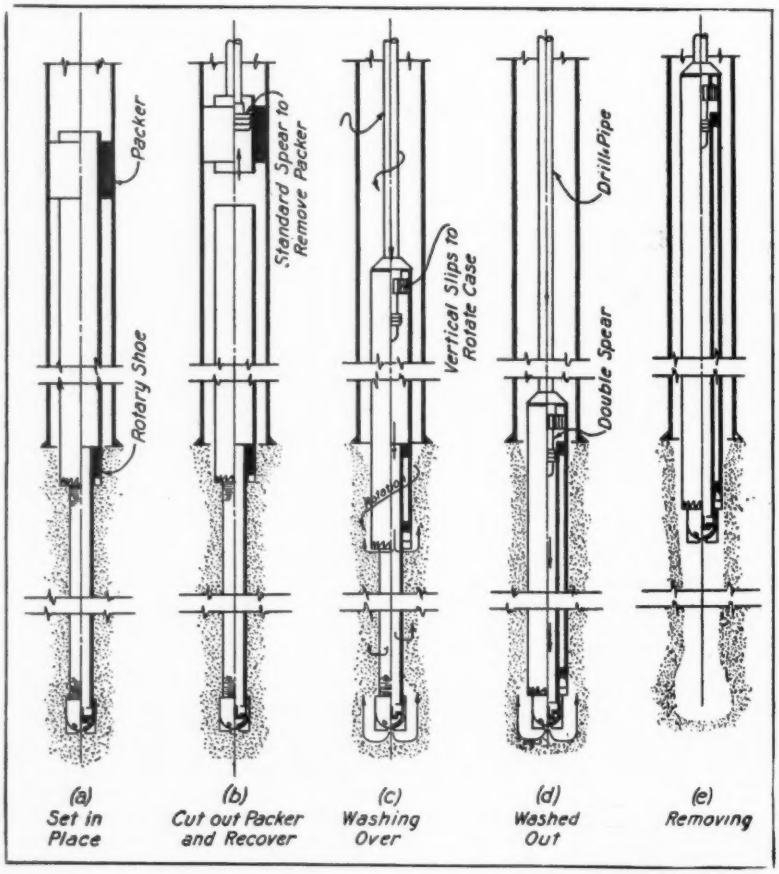


Fig. 2—Step-by-step operations for the recovery of the telescopic well-screening device

A producing well was recently brought in at 12,780 feet—two and a half times the depth of the Grand Canyon. A series of unexpected troubles—such as high temperatures and pressures—almost wrecked the economy of the operation, and would have, had it not been for a painstaking mud control program.

The adaptability of Cyanamid's AEROFLO* Mud Conditioning Compound and QUADRAFOS* (Sodium Tetraphosphate) to the most difficult formations has been proved by a great many applications in both domestic and foreign fields.

With a premium on drilling time, AEROFLO has been especially valuable in improving mud in deep wells where it has resisted rapid thickening due to high temperatures. It has also been effective in increasing the efficiency of phosphates in salt cut muds, as well as in muds that fail to react correctly to chemical treatment.

Contamination of drilling mud due to the presence of calcium and magnesium compounds has been effectively handled by proper additions of QUADRAFOS. Clay agglomerates formed are thoroughly dispersed, and the best drilling properties of the mud are quickly and easily restored.

Cyanamid's modern production facilities and long-experienced research organization—backed by a thoroughly cooperative technical service staff—make AEROFLO and QUADRAFOS a warranty of the best mud-control chemicals money can buy. You can get complete details by consulting American Cyanamid Company, 229 Shell Bldg., Houston, Texas, or Azusa, California. *Reg. U. S. Pat. Off.

‡AEROFLO and †QUADRAFOS are available for immediate delivery from stocks kept by many drilling and mud chemical distributing houses in all principal oil well drilling centers in the United States.

‡AMERICAN CYANAMID COMPANY
(Manufacturer and Selling Agent)
†RUMFORD CHEMICAL WORKS
(Manufacturer)
‡AMERICAN CYANAMID COMPANY
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When Performance Counts—Call on Cyanamid

"A 'HOLE-IN-ONE' BIT," says General Mud, "...would be a neat trick, if it could be done. But all kidding aside—you can get longer life and lots more footage from your bits if you control the lubricating and other properties of your drilling mud with AEROFLO and QUADRAFOS. Why not let Cyanamid help you on the 'tee-off'—the moment you start drilling operations."

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Industrial Chemicals Division

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Prevention and Removal Methods

. . . for Scales in Oil-Producing Equipment

*by L. C. Case**

This article sets out the "how to combat" phases of scale accumulations. It follows the author's discussion, in last week's Journal, of the reasons why scales occur, and several case histories of different kinds of scale occurrences.

HARD scale deposits, consisting essentially of the sulfates of barium, strontium, or calcium, are both difficult and expensive to remove from oil-field equipment. It should be clearly understood from the acid tests which serve to identify this type of deposit that it cannot be removed satisfactorily by acid treatment. Ordinarily, the sulfate scales are sufficiently hard to prevent displacement by either scrapers or boring tools. The last resort of hanging tubing or pipe in the derrick and dislodging the scale with hammers is very unsatisfactory, especially when damage to the pipe is taken into consideration.

Preventive Methods for Hard Scale

Since there exists no convenient nor satisfactory method for the removal of the hard, acid-insoluble deposits, it follows that preventive methods must be used where this type of deposit is definitely troublesome. It has been pointed out that almost all hard scales are due to mingling of unlike waters, invariably so in the case of barium and strontium sulfates. Obviously, then, these accumulations may be prevented by well repair, changes in salt-water-disposal systems, or otherwise obviating the mixtures which precipitate these hard, insoluble compounds. Changes in surface lines are usually rather easily made so that incompatible waters may not mix until the point of disposal is reached.

*Chief chemist, Gulf Oil Corp., Tulsa division.

Preventing Formation of Hard Scales

An outstanding example of scale prevention by this means occurred in the Boston pool, Oklahoma, in 1928. The lead lines of several wells were found badly clogged with barium-sulfate scale. Investigation revealed that some of the wells produced a brine from the Bartlesville sand which carried as much as 250 mg. per liter of barium. Also, it was found that other wells produced a sulfate-bearing brine from the Arbuckle limestone. Finally, it was shown that mixing of these fluids in the lead lines was the sole cause of the troublesome deposits. All lead lines were then changed so that the two salt waters were carried separately to the central waste brine tank. Immediately thereafter it was noted that no further scale formation took place in the lead lines.

Where barium and strontium scales occur on subsurface well equipment, the necessity for repairs to a casing leak is immediately apparent. Thorough consideration should be given to the numerous available methods of water shutoff before abandoning all possible repairs as too costly in view of the estimated remaining life of the well. A packer may serve instead of cementing, or possibly the leak may be found located near the surface

Portable Pipe-Cleaning Machine Efficiently Handles Scale Removal

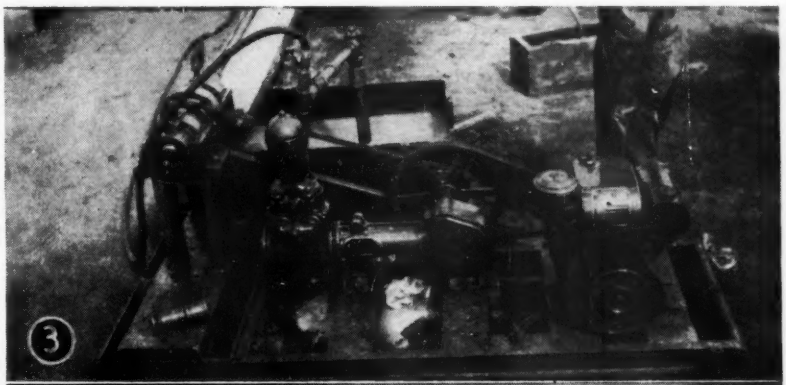
where it may be repaired with relatively little expense.

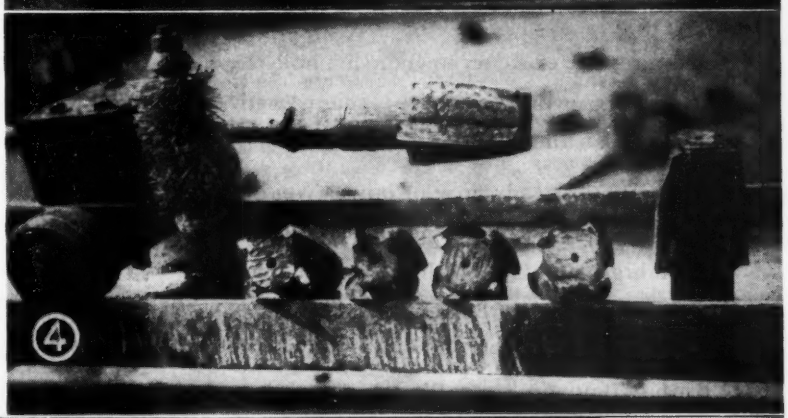
If it is concluded that all possible methods of repairs to a leaky well are impractical, the appreciable alleviation of the hard-scale difficulty may be brought about by down-the-hole treatment. Recent experiences in this type of well treating related by production men seem to indicate that polyphosphates have somewhat varied effectiveness in prevention of the sulfate scales. Early in 1941 Gulf Oil Corp. used a mixture of sodium hexametaphosphate and tannin for prevention of barium-sulfate scale on rods and tubing in wells in the Boston pool, Oklahoma. This treatment was adjusted in alkalinity and contained also some sodium chromate for prevention of corrosion. Subsequent well records proved the treatment to be economical because of materially reduced pulling costs.

Variations of this treatment were also used by Sinclair Prairie Oil Co.[1] in a number of pumping wells in Pawnee County, Oklahoma. Simultaneously, a field experiment was conducted at the Flat Rock disposal plant, Osage County, Oklahoma, of Barnsdall Oil Co., using a combination of hexametaphosphate and tannin to prevent accumulation of $BaSO_4$ scale in the 2-in. waste brine line.[2] The scale was reported as being due to a mixture of Bartlesville brine, containing 18 mg. per liter of Ba, with Wilcox brine, containing 26 mg. per liter of SO_4. The deposit in this waste water line consisted of 81 per cent of $BaSO_4$, with lesser amounts of iron oxide, silica, and alkaline earth carbonates. A series of test nipples placed in the 2-in. disposal line proved before treatment that the carrying capacity of the line was being reduced 0.2 per cent per day near the disposal pump. Following treatment it was found that the scaling rate had been reduced by 99.3 per cent during the 48-day test period. Further, increased carrying capacity of the line indicated the removal of a certain amount of existing scale. These data have noteworthy significance in addition to valuable information concerning scale

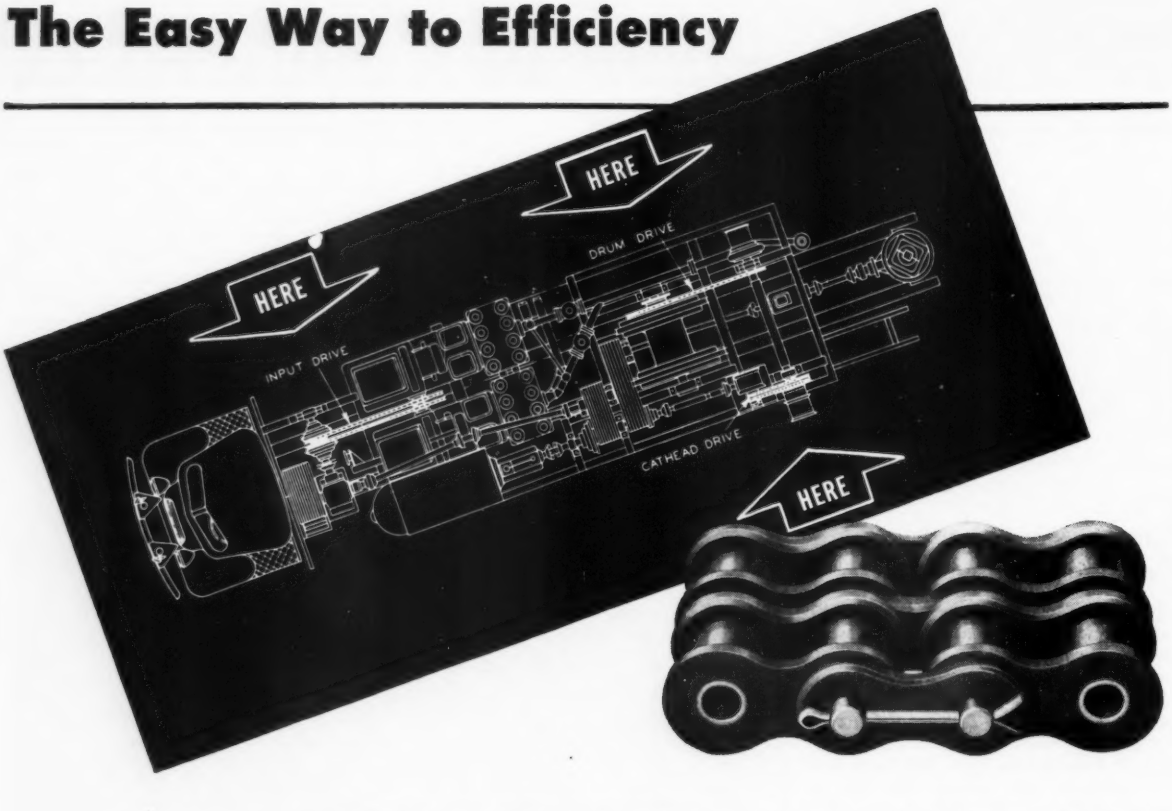
Operation of Pipe-Cleaning Machine

For removing scale and corrosion deposits from flow strings, injection tubing in salt-water-disposal wells, lead lines, etc., engineers in the Tulsa division of Gulf Oil Corp. have designed this portable pipe-cleaning machine. (1) shows unit in operation. It consists of three component parts, the pump unit, the bearing base and drill head, and the channel-iron bed. Small drilling tools and brushes (4) are rotated, depending on type of deposits, at 200 to 500 r.p.m. Pressure circulated fluid is applied to the inside of the pipe. A V-belt take-off drive from the pump unit (3) turns the drilling head which rotates the 1-in. sucker-rod drill shaft. The drill shaft runs along the working bed which is made of four 16-ft. sections bolted together. Three movable hardwood bearings travel along the bed and keep the drill shaft in alignment at all positions of the carriage and prevent whipping action. Pipe to be cleaned is held in a carriage made of angle iron welded to two sets of axles and wheels which move along the bed. On the end of the pipe to be cleaned that is opposite the drill head, a swage conveys the circulating fluid from the pump via a swivel connection and rubber hose. The pile of ground-up scale deposits (5) is from 107 joints of 2-in.





The Easy Way to Efficiency



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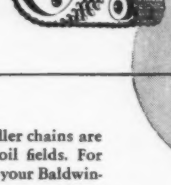

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prevention and removal. The fact is established that the mixing of two brines, having approximately 20 mg. per liter of Ba and SO_4 respectively, causes hard scale of considerable magnitude. From this it should also be concluded that waters of similar nature should not be mingled during water-flooding operations.

More recent observations on field experiments of this sort furnish indications that greater success in prevention of hard scale may be expected for the combination treatments, rather than for those consisting solely of polyphosphates or entirely of organic materials. A pumping well on a lease in the Oakhurst pool, Creek County, Oklahoma, was noted to have trouble from $BaSO_4$ scale on parts of the insert pump so that frequent pulling was necessary. "Batch" treatment with a water-soluble "tank-bottoms treating agent"[3] was reported to lessen considerably the rate of this scale formation and pulling jobs were reduced from 2-week intervals to about 3-month intervals. It may be assumed that this tank bottom compound was almost entirely composed of organic materials.

A recent field experiment was conducted on a lease in the Smith-Mills pool, Kentucky, in an attempt to lessen the rate of gypsum ($CaSO_4 \cdot 2H_2O$) accumulation on subsurface equipment. In this experiment hexametaphosphate alone was fed to the pumping well. No beneficial results were achieved by the treatment and it was discontinued after 2 months' trial. Prevention of gypsum deposits with compounds consisting mainly of organic materials was recently announced under conditions similar to those existing in the pumping wells of the Smith-Mills pool.[4] The latter method is being given a trial by two or more operators at Smith-Mills. It is understood that the treating chemical consists of approximately 97 per cent organic material and 3 per cent polyphosphates.

The "common ion effect" and its role in gypsum deposition has already been mentioned. According to the common ion effect, the addition of a calcium salt to a water saturated with gypsum would tend to throw gypsum out of solution. Conversely, the introduction of unlike ions such as NaCl would increase the solubility for gypsum.[5] Prevention of gypsum deposition by such means would seem of doubtful practical utility because of the large amounts of salt necessary and difficulty involved in its introduction into waste water lines or oil wells.

Gypsum is quite unlike the sulfates of barium and strontium in its solubility. Strong mineral acids do not affect appreciably the latter but gypsum is dissolved fairly rapidly by these acids. Occurrences have been reported of successful removal of decidedly gypsiferous deposits by the use of ordinary HCl. The effects of strong alkalies on the hard scales are somewhat similar to those of the mineral acids. NaOH and KOH do not have any marked effect on $BaSO_4$ and $SrSO_4$. However, strong solutions of these alkalies have a disintegrating effect on gypsum. A recent patent[6] describes the use of concentrated KOH solutions for the purpose of removing gypsum deposits from the bottom of oil wells. Very complete data were also recently published concerning the removal of gypsum deposits from brine evaporators with solutions of NaOH.[7] Available information is now rather complete in regard to the rate of gypsum removal for various strengths of alkaline solutions when used at different temperatures. Nevertheless, it seems doubtful if caustic solutions will prove popular for oil-well treatment because of cost and difficulty in handling these strong solutions in the field.

Mechanical methods for removal of hard scales do not usually accomplish entirely satisfactory results. Slightly better results are obtained on gypsum deposits due to their comparative softness. Jetting with salt water, and salt water containing acid, has been used at Smith-Mills to remove gypsum from the face of the producing sand. Jetting with salt-water-acid mixture is reported to give someghat better results than those obtained by either solidified nitroglycerin or marble shots.

In summary of operating difficulties due to hard scales it may be stated that the most economical method of alleviating these problems is that of preventing formation of the deposits. Furthermore, prevention is accomplished in the most positive manner by not allowing mixtures to take place which cause the precipitation. If this method is definitely impractical, continuous treatment with organic protective colloids, plus lesser amounts of certain polyphosphates, offers considerable promise of future development in reducing the rate of hard scale accumulation. Once allowed to accumulate, the removal of hard scales presents various difficulties which may be overcome only to some extent by full use of the latest developments.

Removal of Carbonate Deposits

Soft scales, consisting predominantly of calcium carbonate, may be removed rather successfully from surface and subsurface equipment by either mechanical or chemical methods. The physical characteristics of these scales vary within a wide range, depending mainly on other materials which usually occur in greater or lesser amounts along with the $CaCO_3$. If line deposits of appreciable thickness consist almost entirely of the carbonate, then they will be so compact that scrapers cannot be used. Boring tools have been used successfully for removal of such compact masses of $CaCO_3$ in tubing and line pipe. Many occurrences have been noted where carbonate deposits contained sufficient oil and other soft material to allow the periodic use of scrapers to keep the lines open.

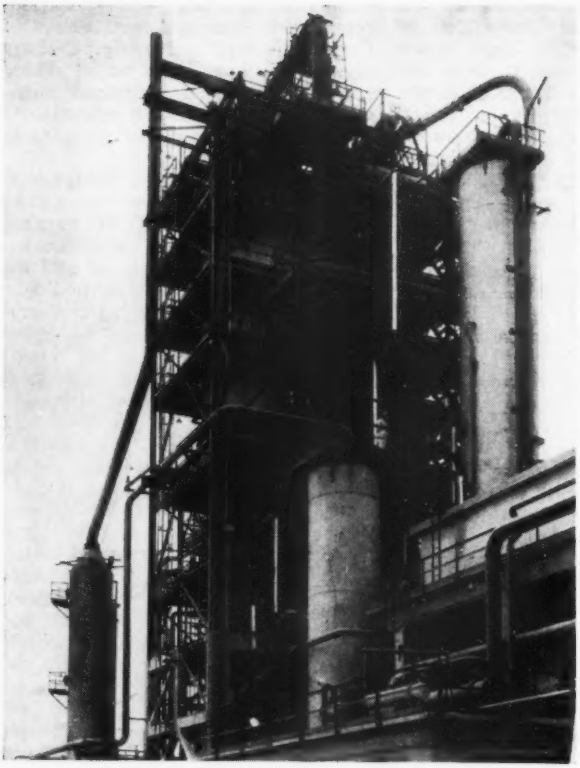
Chemical methods for removal of carbonate accumulations consist mainly of using HCl in varying strengths, but usually with an inhibitor to lessen the rate of acid attack on the steel. This method was probably used on pump parts and on surface equipment as early as 1910 and it was later applied down-the-hole in oil wells.[8] The use of acid solutions for removal of carbonate scale in any type of equipment is intended to accomplish the cleaning in a few hours at most, since this method almost always causes a shut-down in routine operation. Various methods also exist for controlled, slow removal of alkaline earth carbonates without down time in usual operations. Such methods necessitate either the circulation of adjusted water solutions or the addition of small amounts of certain chemicals to all water passing through the equipment to be cleaned. Specifically, very dilute acid is sometimes used, or just enough acid may be added to bring the pH value of the solution to very slightly on the acid side. In the latter method, a pH value of about 6.0 and 10 to 20 mg. per liter of polyphosphate compound is reported to be effective for slow scale removal without corrosion to equipment.[9]

The use of polyphosphates alone has been reported in some instances to have increased the carrying capacity of pipes which were severely clogged with carbonate deposits. Successful use of sodium hexametaphosphate and caustic quebracho tannin for removal of scale from a waste salt water line at Mexia, Tex., has been described in the literature.[10] The deposit in the waste water line at Mexia was found to consist of 77.5 per cent $CaCO_3$. The treatment consisted of continuous addition of 0.2 lb. of tannin-metaphosphate mixture to each 100 bbl. of salt water passing through the line. Three months of the treatment was reported to be sufficient to reduce the line pressure from 110 to 90 lb., meanwhile increasing throughput from 14,000 to 16,000 bbl. daily.

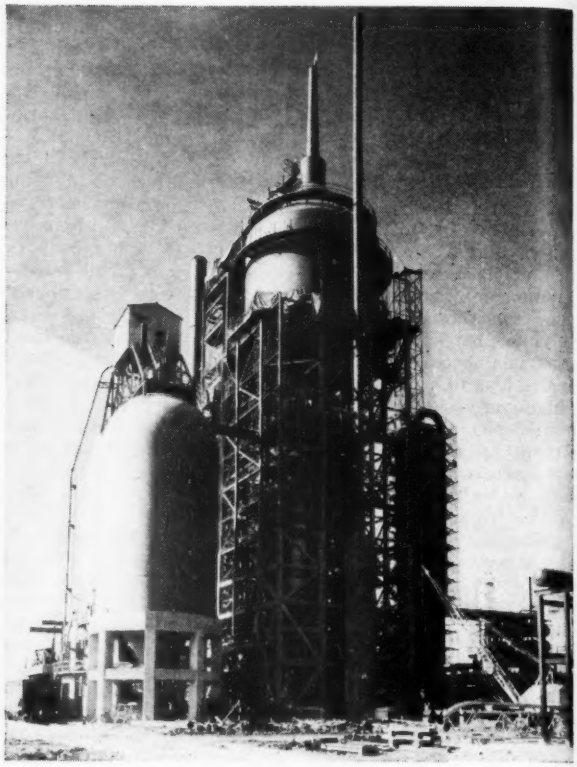
Prevention of Carbonate Scales Is Preferred

It may be seen from the foregoing discussion that the removal of deposits which consist largely or partially of alkaline earth carbonates has become a rather fine art which also promises considerable future development. Nevertheless, the axiomatic value of prevention still holds true. Because of the fact that fairly

(Continued on page 103)



SMALLEST *fluid cat cracker—capacity 2,600 bbl. per day*



LARGEST *fluid cat cracker—capacity 18,000 bbl. per day*

Improved Fluid Catalytic Cracking Unit Reduces Maintenance Costs

by Bernard J. Flock

THE U.O.P. improved catalytic cracking unit has been designed with full appreciation of the fact that if it was to meet economically the needs of the small refiners, its maintenance cost must be kept low.

From the inception of the project it was the determination of the engineers to modify and simplify the design so that the unit could be built at a cost within the reach of the refiner whose operations were on a relatively small scale.

This has been accomplished; the investment necessary to install this improved catalytic cracking unit compares favorably with that required for a thermal-cracking unit of like capacity.

However, it was recognized that to keep down the initial investment was not enough, if maintenance costs were excessive.

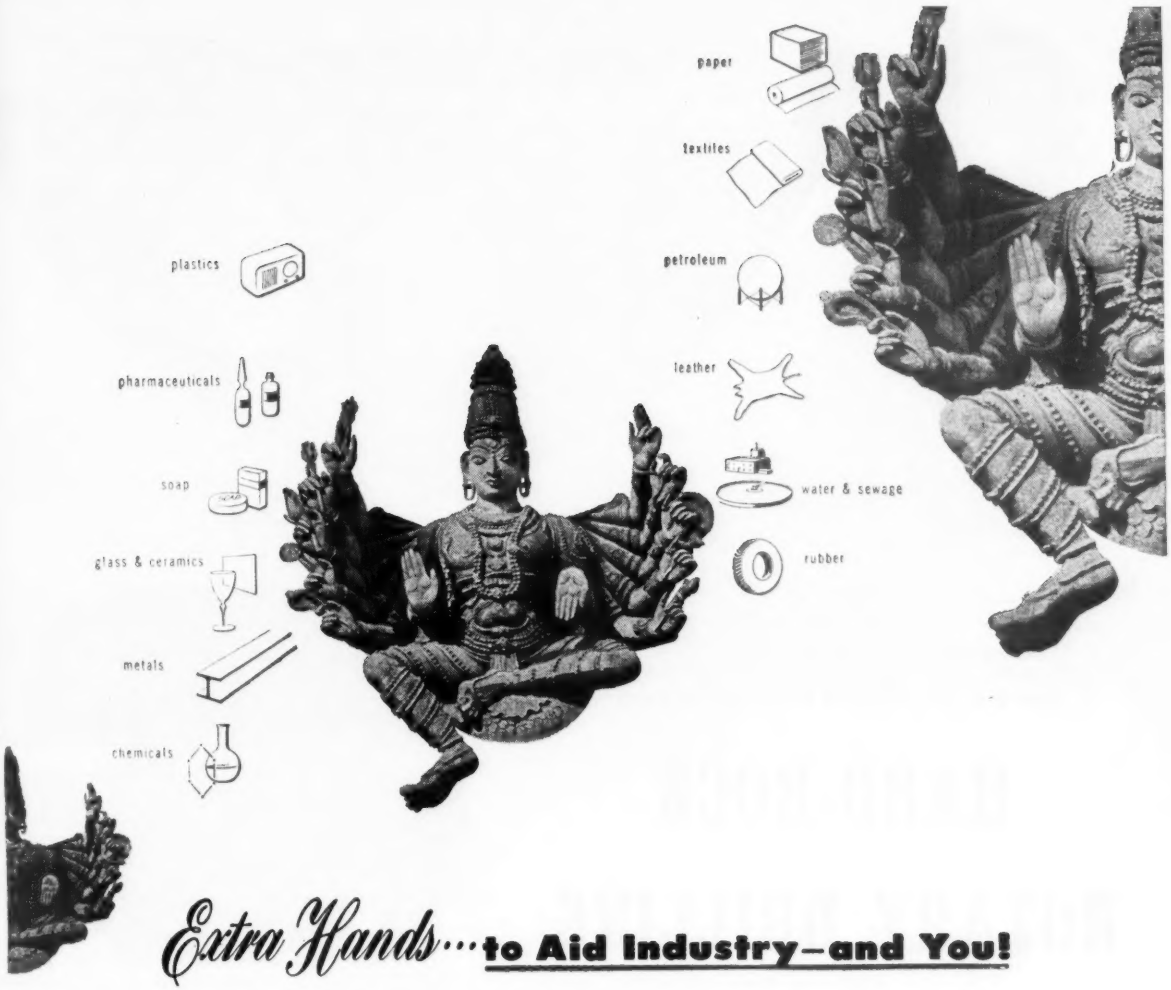
In the older fluid catalytic cracking units, built primarily for wartime service, maintenance costs appeared to be higher than the small refiner could bear in peacetime operation. Experience gained by designing and operating scores of catalytic cracking plants, mostly of large capacity, has been a valuable guide in the development of the latest improved unit.

The lessons learned in combating, and to a large extent conquering, excessive maintenance costs in the larger plants have been applied to reduce those costs for the refiner with a small operation.

Erosion of various parts of the unit by the catalyst was the chief factor contributing to high maintenance expense in the wartime fluid-catalytic cracking plants. Practically every shutdown which delayed the progress of the aviation-gasoline program was due to erosion in one form or another.

(Continued on page 104)

Bernard J. Flock was graduated from the University of Notre Dame in 1925 with a B.S. degree in chemical engineering. A year later he joined the engineering staff of Universal Oil Products Co., starting in the analytical laboratory at Riverside. His next assignment was the operation of pilot plants of which he was soon placed in charge. In 1940 he was transferred to the Chicago office as assistant manager of the service department, being made manager in 1942. During the war his time and efforts were exclusively devoted to furthering the production of 100-octane gasoline in more than 70 units whose operation was the responsibility of Universal.



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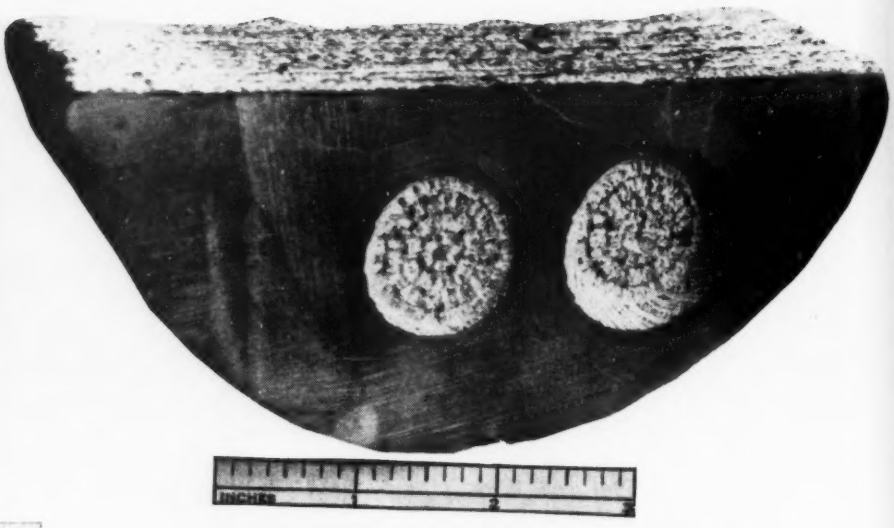


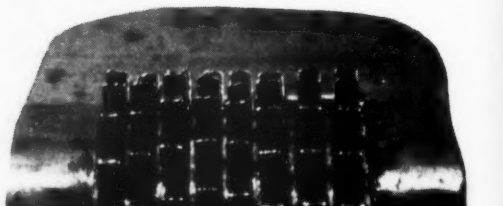


Fig. 1—(Upper left) Side view of microbit. Fig. 2—(Upper right) Bottom-hole cuts made by microbit in a dolomite core from Sealy-Smith West Texas well. Fig. 3—(Right) Bottom view of microbit

HARD-ROCK ROTARY DRILLING

by F. L. Scott

HARD-ROCK rotary drilling combines four main subsurface subjects—the rock; the bit; the circulation, and the drill stem consisting of the drill collars, drill pipe, and tool joints.

The Rock

A drilling contract, successfully completed with profit, requires some knowledge of the formation—whether it be soft earth or granite. Since hard rock may interfere with an otherwise profitable drilling contract, it is wise to study the properties of the material to discover how best it will yield to the drill.

The crushing strength of rocks has been determined by the bureau of economic geology in many of our state universities and colleges, for use by the building trade and highway engineers. Fig. 4 shows the crushing strengths of some Texas rocks arranged in advancing order, according to data developed by the Texas bureau of economic geology, University of Texas.

F. L. Scott, author of this paper, is director of Hughes Tool Co.'s research engineering department and a member of the board of directors. Following graduation from Texas A. & M. College in mechanical engineering in 1914, and a year of teaching manual training in the Fort Worth public schools, he became estimator and salesman for Southwestern Mechanical Co. of Fort Worth. In June 1917 he joined Hughes Tool Co.'s engineering staff, where he has served as tool designer, metallurgist, director of the research laboratory, product engineer in the rock-bit division, and since 1939 he has served in his present capacity. This article was presented at the San Antonio meeting of the American Association of Oilwell Drilling Contractors, October 1-2.

Since dolomite is a hard rock, frequently encountered in the Paleozoic era, let us examine its crushing strength. In Fig. 4 note that it ranks almost equal to granite. Pure dolomite has a Moh's scale hardness of 3.5 to 4 and is hard enough to scratch a penny, while the hardest limestone or marble, having a Moh's scale hardness of 3, will not. Sandy dolomite, or sand rock having a dolomite binder, is as difficult to drill as granite.

When chert (flint) is present in dolomite, the combination offers greater resistance to penetration than granite. Note also in Fig. 4 the crushing strength of quartzite, 68,000 psi., the highest value known for sedimentary rocks. Quartzite may be encountered in the Mesozoic and Paleozoic eras.

Having compared the crushing strengths of various hard rocks, let us connect their local names with our geology and geography. Some of these are listed in Table 1.

Speaking and presiding at the A. A. O. D. C. meeting at San Antonio

WILLIAM T. PAYNE | J. E. BRANTLY | N. H. WHELESS | HOWARD P. HOLMES

Payne, president of the American Association of Oilwell Drilling Contractors and head of Big Chief Drilling Co., Oklahoma City, delivered the president's address at the opening session on October 1, with W. C. Morris of Allen & Morris, San Antonio, presiding. Guest speaker at the evening meeting was J. E. Brantly, president, Drilling & Exploration Co., Inc., Los Angeles and Dallas. Wheless, president, N. H. Wheless Drilling Co., Shreveport, presided at the morning session on October 2, and Holmes, president, Two States Drilling Co., Dallas, at the afternoon session. Besides this paper on Hard-Rock Rotary Drilling, there appears in this issue on page 100 a second paper from the program, and another is scheduled in an early issue

The term "hard" as applied to rock in the preceding paragraphs defines its comparative crushing strength or resistance to penetration. Another use of the word hard is in the sense of its abrasive property, or its ability to cause rapid wear. The Moh's scale of hardness was created to measure, by convenient means, the comparative resistance of one material to the abrasive or scratching action of another. For example the diamond was rated 10, corundum (aluminum oxide) 9, topaz 8, quartz 7, feldspar 6, etc., each scratching the other in descending order.

The most abrasive formations the oil-well driller usually penetrates have a hardness of 7 on Moh's scale. Silica sand, chert, flint, chat, and quartz, having a hardness of 7, and iron pyrite, hardness 6 to 6.5, are the familiar names of those minerals that wear out drilling tools. Since the hardness of the steel cutting surfaces of rotary drilling tools is approximately 7, there is need for wear protection which is provided by tungsten carbide, rated at 9.4.

TABLE 1

Local name—	Composition	Geologic period	Geographical location
Arbuckle lime	Dolomite	Cambro Ordovician	Okla.-Kans.
Devonian lime	Dolomite	Devonian	Ky.-Ill.-W. Tex.-C. Tex.,
Devonian chert	Dolomite and chert	Devonian	W. Texas
Ellenburger lime	Dolomite and chert	Ordovician	W. Tex.-N. Mex.
Embar lime	Dolomite	Permian	Wyoming
Gilcrease sand	Quartzite	Pennsylvanian	Oklahoma
Mississippi lime	Dolomite	Mississippian	Okla.-N. Tex.-West Cent. Tex.
Madison lime	Dolomite	Mississippian	Montana
Oriskany sand	Quartzite	Devonian	Ohio-W. Va.
Travis Peak sand	Quartzite	Cretaceous	N. La.-E. Tex.
Viola lime	Dolomite	Ordovician	Oklahoma
Wilcox sand	Quartzite	Ordovician	Oklahoma

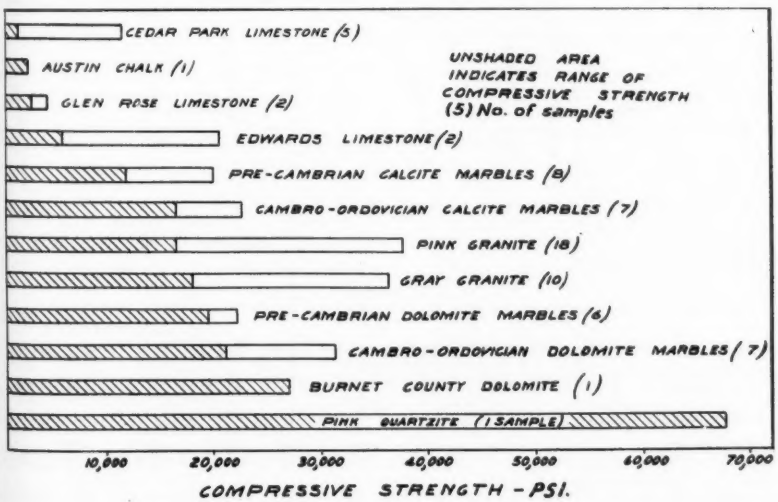


Fig. 4—Compressive strengths of Texas building stones

To assist in correlating the drillability of a rock with crushing strength, a laboratory tool (Fig. 1 and Fig. 3) was developed to test the "feel" of small rock samples. Called a microbit, it is run with various effective weights in an ordinary drill press at 45 r.p.m. A small depression (Fig. 2) remains after the test.

Rate-weight results with test bits are illustrated in Fig. 5. Note how drilling rate decreases as crushing strength increases, and how close the drillability of dolomite approaches that of granite. Drillability in this discussion is defined as a rate-weight ratio where rate is feet per hour and weight is pounds force acting on the bit.

Fig. 6 indicates the drillability of

a few different rocks developed from sharp full-size rock bits. Here again, the greater the crushing strength, the slower the drilling rate for a given bit loading.

To use Fig. 6, assume that a driller is instructed to use 8,000 lb. at 60 r.p.m. on an 8-in. bit and he is to make hole through the rocks in the order shown, starting in soft limestone. The following drilling rates can then be expected:

	Ft. per hr.
Soft limestone	40
Marble	10
Dolomite	2
Granite	1½
Quartzite	¼

On the other hand, still remembering Fig. 6, if the driller were instructed to maintain a constant penetration rate of 5 feet per hour, allowing the weight on his 8-in. bit to vary as required, then the following loads would be required:

	Pounds
Soft limestone	1,600
Marble	5,600
Dolomite	13,600
Granite	14,400
Quartzite	24,000

As indicated in J. E. Warren's paper, A.P.I. 851-20 B, June 6, 1946, on "Rate of Penetration in Hard-Formation Drilling," (The Oil and Gas Journal, June 8, page 82), use of heavy weight, where applicable, improves footage and penetration rate in the hard dolomite in the Fullerton field, West Texas. However, in some softer formations, increased weight only flounders the bit. The trial-and-error method must be used to get best results.

Where long strings of collars are used to obtain weight, it has been found best to rotate at 50 to 60 r.p.m. to avoid connection trouble and excessive bearing wear in bits. Weights of 35,000 to 40,000 lb. have been successfully used on 8¾-in. bits and 60,000 lb. on 12¼-in. bits.

One conclusion can be drawn from the foregoing. In dolomite we are dealing with a hard rock having high strength. A sharp bit, when run on dolomite with initially heavy weight, will suffer undue tooth breakage. A program including a minimum starting weight, with a gradual increase as the bit dulls, would not only maintain an average desirable penetration rate throughout the run, but should secure more footage per round trip.

The roller-type drill consists essentially of teeth provided on one or more rollers supported by bearings mounted on a bit body. The drill stem provides the weight to cause the teeth to penetrate the rock as the assembly is rotated by power at the surface. Circulating fluid is pumped down the stem to clean the cutters and carry the cuttings up to ground level.

As the teeth are rolled into hard rock, bending stresses are set up tending to break off the tooth crests. Abrasive minerals in the rock scratch and tear at the teeth to dull them. Circulating fluid, more or less sand laden, tends to blast away the entire cutting surface. Only the highest type of steel can live under these circumstances. Tungsten carbide protection at the gage, especially, is necessary for preserving well bore diameter.

Because of high stress and shock loads the cutters must be made of carburized steel to provide against breakage and loss in the hole. The estimated strength of the case is 300,000 psi., and that of the core is 125,000 psi.

For hard rock the teeth are spaced to provide maximum depth for longer life, and minimum included angle for delayed dulling, yet having adequate section to resist breakage. As the teeth on the cutters contact bottom they tend to generate rock teeth. This is discouraged as much as possible by tooth arrangement to destroy the rock gear. There is a noticeable creep of the cutters as they roll on bottom as can be seen by the spiral markings on cores taken with roller-type core bits.

Perhaps this creep is responsible for reduction in footage per round trip when high rotary speeds are employed. Rate of penetration in almost any formation is increased by fast rotation and this is preferred technique in some localities where conditions warrant. In general, the slower the rotation, the greater the footage per round trip.

The bearings on which the cutters are mounted have a life expectancy depending on the weight used and the speed of rotation. Fig. 7 drawn from data published by roller bearing manufacturers indicates generally the capacity of bearings of a size that could fit in various sizes of roller cutters. Note that the capacity of a bearing is increased by reduction in speed of rotation. Also note that the bearing in a 12-in. bit can support considerably more than twice as much as that in a 6-in. bit.

Fig. 8 also has been drawn from data published by ball and roller

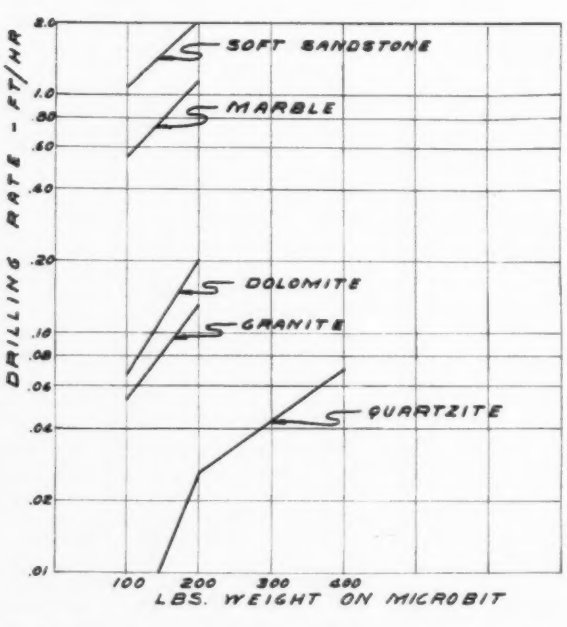


Fig. 5—Curves showing drillability of different formations as obtained with microbit at 45 r.p.m.

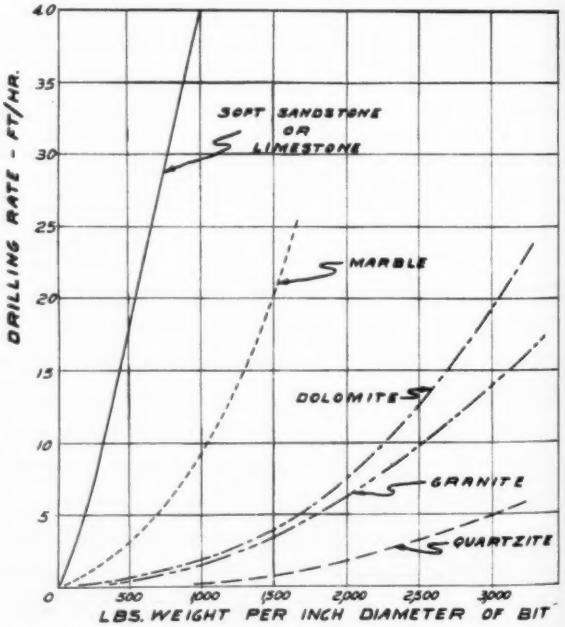
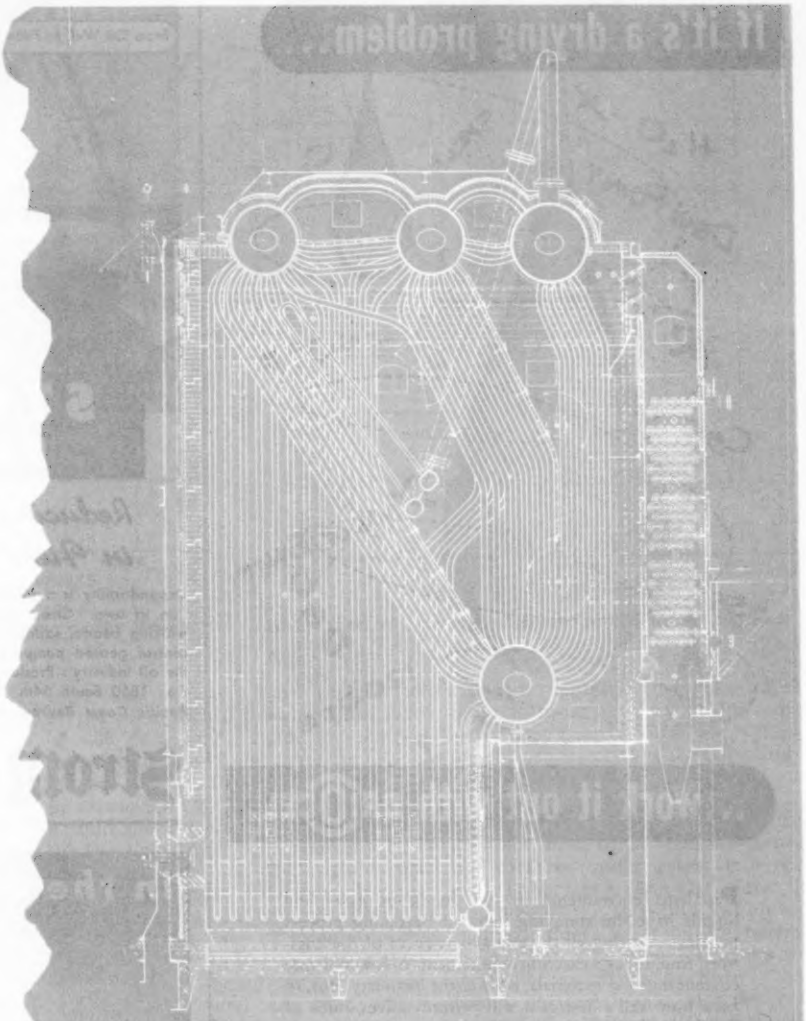


Fig. 6—Drilling rates for various formations versus bit weights (60 r.p.m., 4¼ to 12¼ in. diameter)

WICKES 4-DRUM BOILERS

TIME TESTED AND POWER PROVEN



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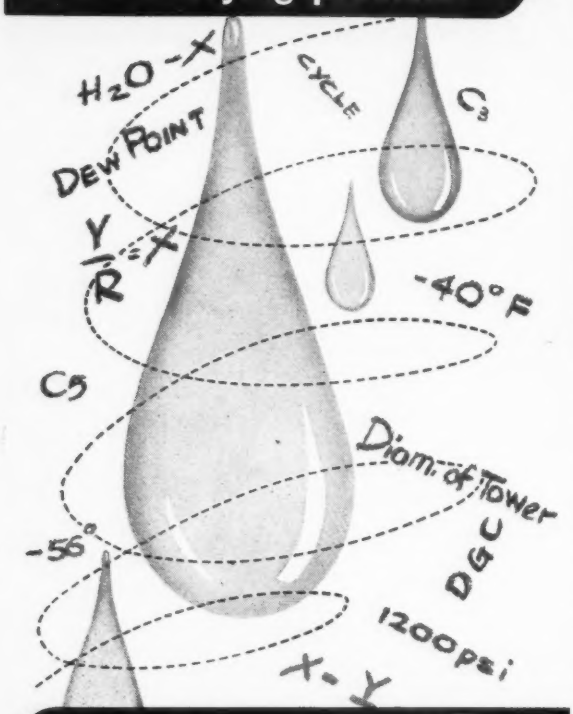

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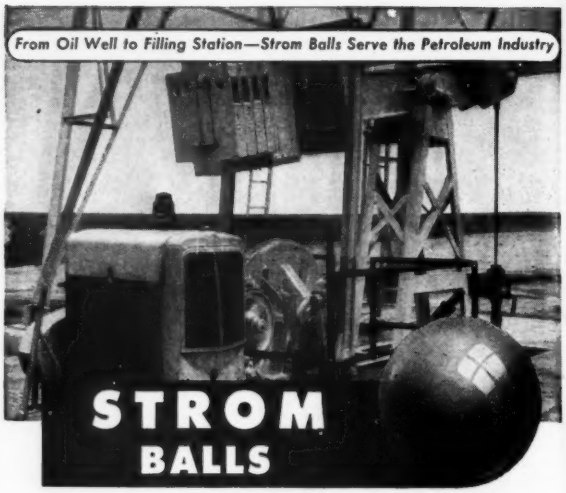

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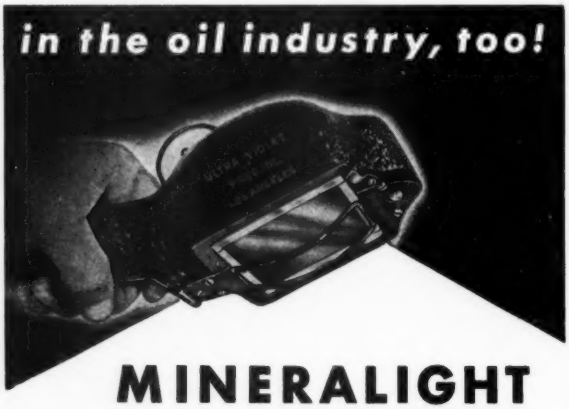

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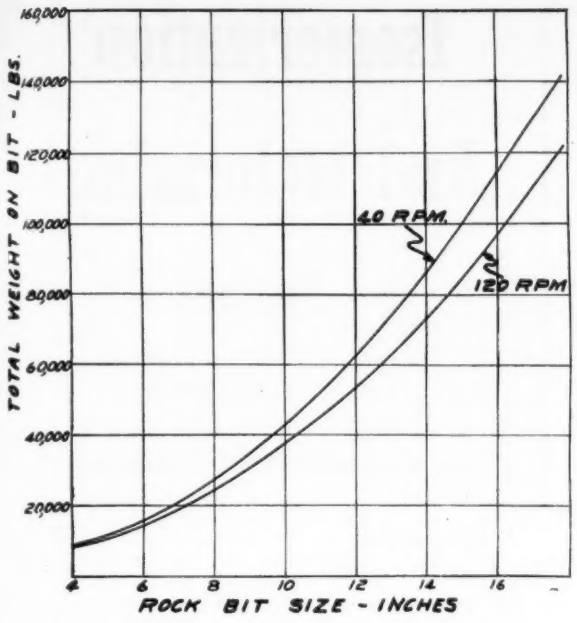

Fig. 7—Effect of rotative speed on roller bearing capacity (based on 10-hour service life)

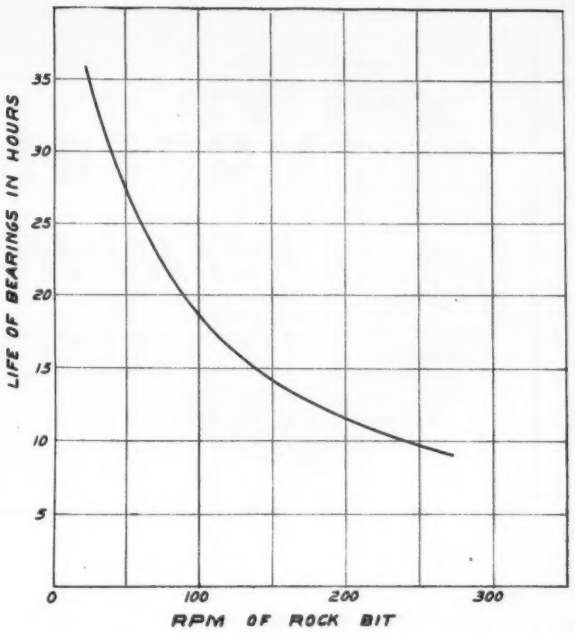

Fig. 8—Effect of r.p.m. on roller-bearing life of an 8-in. rock bit at 20,000 lb.

manufacturers. This shows that a bearing having the size to fit in a roller cutter on an 8-in. rock bit will last 27 hours at 50 r.p.m. as compared to 18 hours at 100 r.p.m., assuming a load of 20,000 lb. Both Figs. 7 and 8 are exhibited more to show the general effect of rotary speed rather than to show absolute bearing values.

After a year of experience with heavy weight operation in West Texas, the bearings in rock bits have given satisfactory performance at rotary speeds of 50 to 60 r.p.m.

Circulation

The circulating fluid is employed primarily to bring the cuttings to the surface. In the soft gummy formations such as Red Beds, gypsum, etc., large-volume circulation is necessary to clean the cutters for fast penetration rates. In the hard-rock strata, however, there is not as much need for as great a volume and considerable savings may be realized from a reduction in revolutions per minute of the mud pump, other conditions permitting.

Cuttings of the various hard rocks have been timed as they fall through clear water and mud. Chips of limestone, dolomite, anhydrite, and granite fall through clear water at an average rate of 1 ft. per second and through 30-viscosity mud at an average of ¾ ft. per second. Upward velocity of flushing fluid around the outside of the drill pipe must, of course, be greater than their rate of fall to bring them to the surface.

To visualize what goes on at the bottom of the hole let us assume that an 8¾-in. bit on a 4½-in. drill stem is drilling ahead in hard rock at 10 ft. per hour with a flushing fluid rate of 400 gal. per minute. By simple calculation we find that, for each elapsed second, the bit has advanced downwardly 1/30 in. and in that same second the flushing fluid has moved up the hole 34 in. The concentration of cuttings per inch of the fluid column outside the drill stem is thus seen to be exceedingly small. Perhaps a reduction in rate of circulation to 2 ft. per second in known areas where hard rock is being drilled would work just as well and also effect economies in fuel and upkeep of equipment.

The black shale encountered in West Texas does not drill well when certain additives are mixed with the circulating fluid. Perhaps a filter cake, even though it be thin, forms on bottom as well as the wall of the hole to form a blanketing diaphragm which might well hold cuttings there against dislodgment. Laboratory tests indicate a reduction in speed when cutting porous sand rock, using mud, when back pressure is placed on returns, although no difference could be found with same mud drilling under atmospheric pressure as compared to clear water. It does not seem readily apparent at this time what can be done to improve this condition.

The Drill Stem

Drill collars at the bottom of the drill stem if properly cared for do not give much trouble. Certain facts have come to light in recent years, however, that indicate further reduction of connection trouble can be attained. Metallic lead-base lubricants seem to have noticeable superiority over the zinc-base type. Reason for this superiority may be found in the physical properties of the two metals.

Lead, being much weaker than zinc, does not build up as thick on contacting surfaces under pressure as does zinc. Laboratory tests also show that lead smears out in a thin foil on tool-joint shoulders whereas the particles of metal in zinc-base lubricants tend to gather in drifts to form a hard island pattern which may be compressed to a thinner dimension while the drill collars are at work.

The whole idea of metallic-base lubricants is to prevent metal-to-metal contact, and subsequent galling of connecting threads and shoulders. Careful laboratory tests have shown that to prevent galling of connection surfaces, they should not be allowed to touch. Measurement of force acting on a 4½-in. A.P.I. full-hole tool-joint shoulder shows that the stress set up amounts to 100,000 psi., using a torque of 12,000 lb.-ft. This is the torque usually applied with four wraps on the cat head. Nonmetallic greases squeeze out under this pressure.

Even small galls which create a phonograph record surface on a tool-joint shoulder represent small keys which help prevent sufficient makeup. Sufficient makeup implies that the pin stretches and the box squats elastically to store up enough reserve of compression in the connection that tightness is insured, even after minute irregularities are ironed out while the

(Continued on page 98)

Isomerization And Isoforming

2—Pentane

PART 15 OF A SERIES

by George Armistead, Jr.

AS indicated in the previous portion of the article on this subject, the process is also used for the isomerization of mixtures of pentane and hexane, operating under similar conditions and giving correspondingly similar results. When designed for the isomerization of normal pentane alone, the arrangement is slightly different, particularly with regard to the employment of benzol as the suppressant of cracking and the somewhat different fractionation system, one form of which is shown in Fig. 14-3. Here it will be noted that the fresh feed which may be the pentane fraction from an alkylation plant depentanizer goes first to the isopentane tower from which any initial isopentane and lighter is removed as overhead. The normal pentane, along with any heavier material, passes from the base of the isopentane tower to a rerun tower where the hexanes plus are removed as bottoms and the overhead after condensation comprises reactor feed. This reactor operates similarly to that previously described with a small amount of benzol (0.5 per cent) being introduced with the feed to reduce cracking and extend catalyst life. The reactor effluent passes into an accumulator for separation of entrained complex and the hydrocarbons are passed through the HCl stripper where the HCl is removed and returned to the reactor inlet and the stripper effluent passes to the caustic and water wash. This effluent after neutralization returns to the isopentane tower from which the isopentane is taken as the overhead product along with the initial content of isopentane in the feed. This overhead fraction passes to a debutanizer from which C_4 and lighter contained in the feed or originating in the process is produced as overhead and the isopentane product as the bottoms.

Typical operating conditions in pentane isomerization are as follows:

Reactor temperature, °F.	195-230
Reactor pressure, psig.	260-270
Space velocity, v./v./hr.	0.3 to 0.7
Catalyst depth, ft.	20-25
Benzene, wt. % reactor charge	0.3 to 1.3
HCl, wt. % of reactor charge	4-5
$AlCl_3$ injection rate, lb./bbl. reactor charge	0.7 to 1.0

Characteristic once-through yields of the pentane isomerization process[1] are shown below:

	Weight %
Dry gas	0.1
Butane	1.7
Isopentane	62.0
Normal pentane	34.8
C_6 and heavier	1.4

Under the arrangement shown in Fig. 15-1, the unconverted normal pentane is recycled to the system and the conversion per pass is limited by the equilibria which prevail between the pentanes in the reaction. The conversion per pass is similar to that indicated for single-pass operation above.

Numerous chemical engineering problems were encountered in the development of this process including several features relating to vapor-liquid equilibria in the HCl absorber and in the reactor as was discussed by Swearingen et al.[2] The aluminum chloride - hydrocarbon complex is highly corrosive and was found to corrode carbon steel at the rate of 1-20 in. per year depending upon turbulence, HCl concentration, and

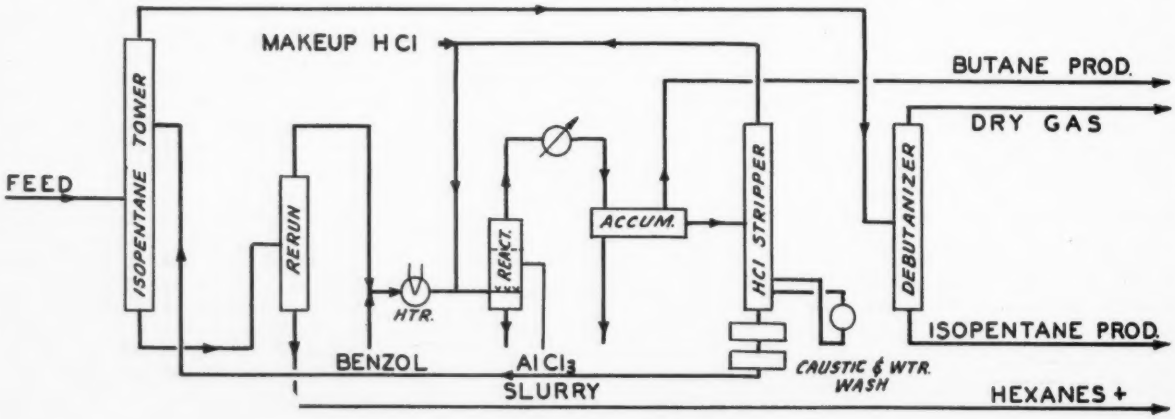

Fig. 15-1—Pentane isomerization unit

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amount of free $AlCl_3$ in the complex. Experimental work indicated that Hastelloy "B" was the only metallic material which would successfully withstand action of the complex in such service as the reactor and its distributor pipe. Principal operating experience, however, has been with nickel reactor linings, themselves lined with protective refractory materials and with water cooling on the outside of the vessel shell, which was found greatly to decrease corrosion. In this arrangement no objectionable amount of corrosion has been so far indicated.

Isoforming

Another application of isomerization of motor-fuel constituents is that designated as isoforming which has been disclosed only to a limited extent in the literature[5,6,7] and currently has no commercial installations. This process is applicable to octane improvement of thermally cracked gasolines such as, for example, the low-octane product (55-60 A.S.T.M.) from thermal coking of residues. It is also applicable to other thermal cracked gasolines, producing a 5-10 number improvement in A.S.T.M. octane with a volumetric yield in the neighborhood of 95-97 per cent.

The isoforming process is a catalytic operation in which the vaporized gasoline is passed over a catalyst at temperatures generally between 750° and 1,000° F. and at pressures at 5-20 psig. Exceptionally high space rates are employed, these ranging from 4 to 40 and may be, preferably in the range of 8 to 20 v./v./hr. The catalyst employed is generally a silica-alumina material similar to that employed in the catalytic cracking of gas oils, including activated natural clays of the Super Filtrol type. The mechanism of the process, according to available publications, is somewhat obscure, but it is not primarily a cracking reaction, as evidenced by the small gas production. It would appear to involve some selective isomerization or other conversion of certain of the particular lower-octane hydrocarbons present in the thermally cracked naphthas. The isoforming process has little or no effect on catalytically cracked naphtha, indicating the difference in the type of compounds present in it compared with thermal cracked gasoline. The reactions involved are such that increases of 5-10 A.S.T.M. octane numbers with a much greater increase in C.F.R.-R. and road octane number are obtained with yields of 95-99 per cent of a product of substantially the same boiling range as the charge. In addition, the TEL response of the gasoline is materially improved. The difference between the yield and 100 per cent results chiefly from the production of about 1 per cent gas, and about 0.05-0.1 per cent of coke and heavier-than-gasoline yields of about 1 per cent. Characteristic results of the operation on two different stocks are shown in Table 15-1.

A feature of interest in connection with the isoforming process is the yield-octane relationship. In other octane-improvement processes, such as thermal reforming and hydroforming, this relationship usually involves progressive improvement of octane with decrease in yield, the curve gradually flattening to smaller increments of octane improvement per unit of yield loss, up to the practical limits of the operation. In the isoforming process, however, the octane number improves to a certain point, for example, in the range of 95 per cent yield, and then starts to degrade with increasing severity of the operation. This is illustrated in Fig. 15-2 from Thiele et al[7] Fig. 15-3 illustrates the effect of space rate on the isoformed octane for two different feed stocks having 59 to 65 A.S.T.M. initial octane num-

(Continued on page 104)

TABLE 15-1—ISOFORMING RESULTS

Stock—	Mid-Continent 400° F. e.p. thermally cracked		Delayed coker naphtha	
Treatment—	None	Isoformed	None	Isoformed
Yield, volume per cent of charge	100.0	98.5	100.0	97.0
Octane numbers:				
A.S.T.M., clear	68.1	73.4	59.0	68.6
+3 cc. TEL/gal.	76.6	81.0	...	...
C.F.R.-R., clear	...	...	63.1	75.3
Reid vapor pressure, lb.	9.9	10.0	3.2	6.3
Mercaptan sulfur, per cent	0.011	None	...	...
Total sulfur, per cent	0.05	0.04	...	...
End point, °F.	403	440	...	...
Reference	(5)		(6)	

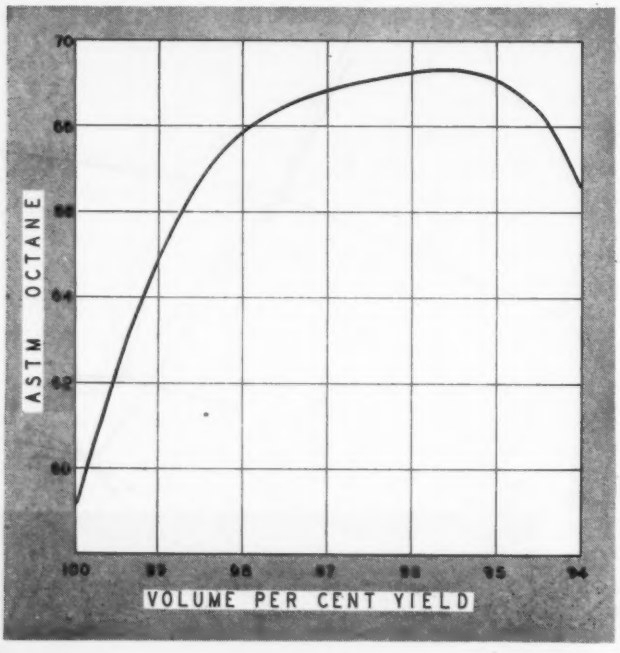

Fig. 15-2

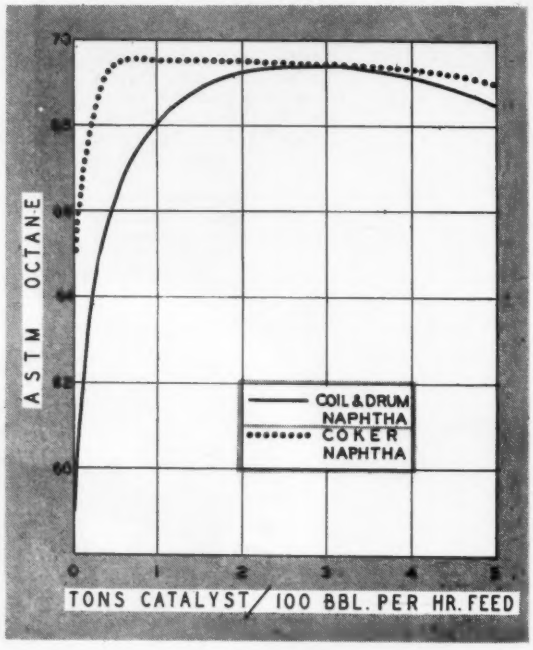

Fig. 15-3

Isoforming thermally cracked naphtha over silica-alumina catalyst at atmospheric pressure and 925° F. (Thiele et al. U. S. Patent 2,326,705)

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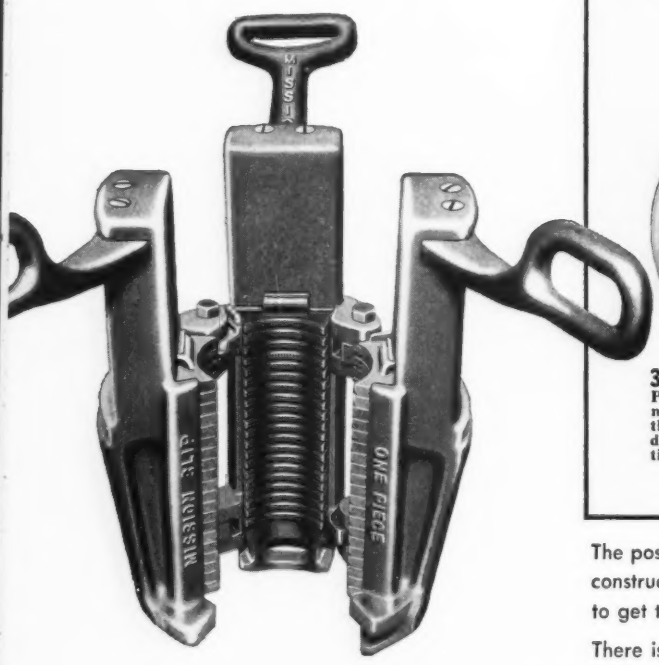
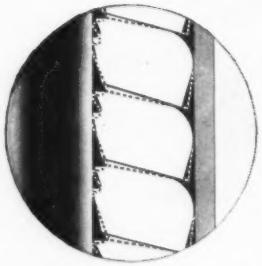
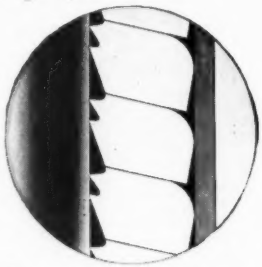


MISSION ONE PIECE REGULAR ROTARY SLIP

Positive Grip



1 WHEN SLIPS ARE DROPPED IN BOWL, the Dogs roll upward slightly . . . Notice how the Mission tooth design insures positive gripping even after teeth are worn.



2 WHEN LOAD IS BEING TAKEN BY SLIPS, the Dogs roll downward to grip the pipe firmly . . . This positive gripping saves much time usually lost in trying to make ordinary slips hold.

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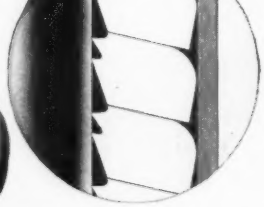
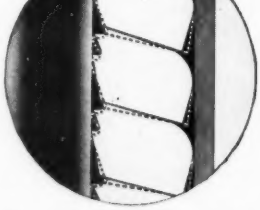


3 NOW SLIPS ARE SUPPORTING PIPE: The small, non-continuous dog teeth grip the pipe firmly with minimum damage. These teeth give exceptionally long life.



4 NOW LOAD IS BEING TAKEN OFF SLIPS: Notice how the dogs roll upward and away from the pipe—releasing the pipe and freeing the slips from the bowl.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Pipe Still Transfer Line

The temperature in the feed point on our topping tower is not recorded but we have the temperature at the outlet of the pipe still. How much lower is the temperature in the tower?—G.B.A.

This difficulty arises frequently and although the pipe-still-outlet temperature is of some value in operating the pipe still, the vaporizer temperature in the tower is in general much more important and it is unfortunate that plant contractors do not regularly install a thermocouple a this point.

The question is a troublesome one and it cannot be answered except in a general way. Each situation is different from every other installation because of variations in:

1. Material processed—particularly the width of the boiling range as measured by slope. In the discussion which follows two stocks are considered—Stock "A" with a true-boiling-point slope of 4.0 and Stock "B" with a slope of 7.0.

2. Percentage vaporized in tower. This vitally affects the temperature drop in the transfer line because a high velocity in the line causes a large drop in pressure with a correspondingly large vaporization and temperature drop in the line.

3. Throughput. Obviously the larger the throughput the greater the pressure drop, vaporization, and temperature drop in the line. In the studies which follow the cold velocity (volume measured at 60° F.) is used to indicate the throughput.

These many variables cannot be related by a simple mathematical relationship but computations can be made as follows:

For a zone in which a known and selected amount of vaporization occurs:

$$\Delta t = t_1 - t_2 = \frac{L}{h} \Delta V$$

$$\Delta V = V_2 - V_1$$

in which:

V = selected amount of vaporization in the zone.
t_1 = temperature at inlet to zone, °F.
t_2 = temperature at tower, °F.
L = latent heat of fraction that vaporizes taken at average of t_1 and t_2.

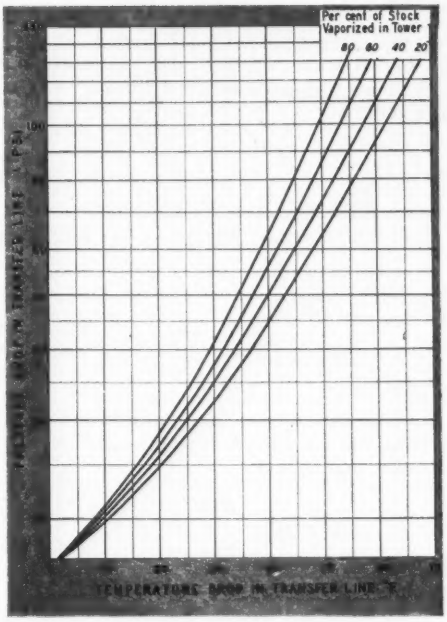

Fig. 1—(Left) Vaporization in transfer line between pipe still and tower in atmospheric-type distillation systems when processing a 40° A.P.I. stock having a true-boiling-point slope of 4° F. per per cent

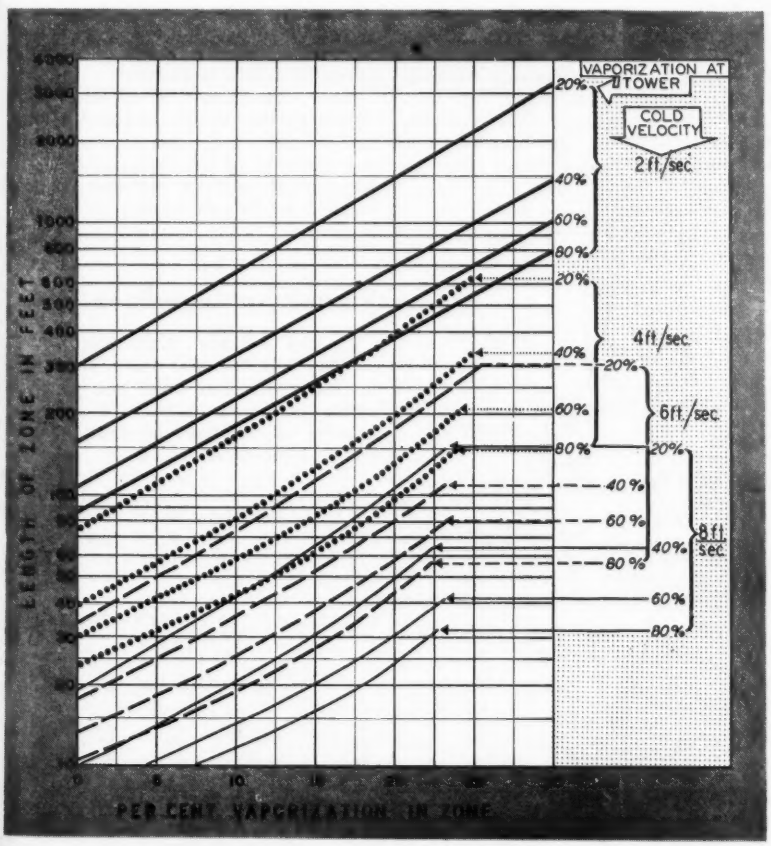

Fig. 2—(Above) Relationship between temperature drop and pressure drop in transfer lines of atmospheric distillation units operating on 40° A.P.I. stocks of true-boiling-point slope of 4° F.

h = specific heat of entire stock between t_1 and t_2.
V_1 = fraction of stock vaporized at inlet to zone.
V_2 = fraction of stock vaporized at vaporizer section of tower.

For this zone of known and selected amount of vaporization, the 760-mm. flash vaporization temperature of the stock at the inlet to the zone can be ascertained by drawing the flash vaporization curve of the stock. To raise this temperature, designated as t_f, to the actual temperature at the inlet to the zone (t_2), requires pressure.

The amount of pressure required can be obtained by use of the vapor-pressure charts for oils such as that found on page 131 of the 2nd Edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc.,

TABLE 1—APPROXIMATE RELATION BETWEEN PERCENTAGE VAPORIZATION AND TEMPERATURE DROP IN TRANSFER LINES

Per cent Vaporization in transfer line	Temperature drop in transfer line— 20% Vaporized in tower	40% Vaporized in tower	60% Vaporized in tower	80% Vaporized in tower
5	7.3	8.0	8.6	9.1
10	14.6	15.8	17.0	18.5
15	21.8	23.6	25.2	27.5
20	29.1	31.4	33.6	36.8
25	36.4	39.2	41.8	46.0
30	43.8	47.1	50.3	

N. Y., 1941). The pressure so found is the pressure at the inlet to the zone, and the pressure drop through the zone is:

$$\Delta P = P_1 - P_2$$

in which:

P_1 = pressure at inlet to zone, psi.
P_2 = pressure at tower, psi.

The pressure drop may also be related to regular friction loss formulations, as:

$$\Delta P = \frac{.323\ fsu^2L}{D}$$

The friction factor, under these conditions, has an almost constant value of 0.005, and hence:

$$L = 620\ \frac{PD}{su^2}$$

in which:

L = equivalent length of zone, ft.
D = inside diameter of line, in.
s = specific gravity of fluid at zone conditions.
u = velocity of material at zone conditions.

The specific gravity (s) and velocity (u) should be determined for the average temperature, pressure and amount of vaporization in the zone. Mathematically the logarithmic mean average should be used but for zones in which small vaporization occurs the plain arithmetic average properties may be employed.

Fig. 1 shows the relation of length of transfer-line, amount of vaporization in transfer line, cold velocity (2 to 8 ft./sec.) and percentage vaporized in the tower, for a 40° A.P.I. stock which has a true-boiling-point slope of 4° F. per per cent. The complexity of the relationship in the transfer line is apparent in Fig. 1. Similar data have been worked out for a stock of a slope of 7.0 and it will probably be published at a future date in The Refiner's Notebook which is currently appearing in The Oil and Gas Journal.

The temperature drop in the transfer line is shown in Table 1. After the percentage vaporization has been determined from Fig. 1, the value so obtained can be used in Table 1 to estimate the temperature drop.

Likewise, the relationship between temperature drop and pressure drop in transfer lines is shown in Fig. 2.

What Are Cyclones?

In catalytic cracking plants, "cyclones" are used. What are cyclones and how do they work?—R.C.F.

The fluid catalytic cracking process employs finely powdered catalyst. This powder settles so slowly that cyclones or cyclonic dust separators must be used to keep the finest particles from escaping from the reaction and regeneration chambers. The finest particles are smaller than 10 microns (1 micron equals 1/1000 mm.) The rate at which such particles will settle in quiet air is indicated in Table 1.

TABLE 1—THEORETICAL RATE OF FALL OF ROUND PARTICLES IN AIR

Diameter, microns	Nearest screen mesh	Rate of fall, ft./sec.
100	155	3.0
74	200	1.6
44	325	0.6
10	...	0.03
1	...	0.0003
0.1	...	0.000003

Table 1 is significant because the rate of fall is also the maximum air velocity that can be used if the particles are to settle from the air. Thus, a settling vessel that handles only 10 cu. ft. per second of dust-laden air must be larger than 21 ft. in diameter in order to allow the separation of even 10 micron particles. These vessel diameters are so great that cyclone separators which utilize centrifugal force to throw out or separate the dust particles are widely used.

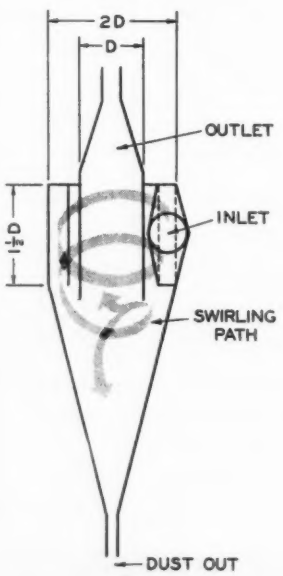

Fig. 1—Standard large-diameter cyclone separator

The common long-cone or large-diameter cyclone shown in Fig. 1 consists simply of (1) an annular space into which the gas is admitted tangentially so that it proceeds in large degree in a circular motion; (2) a cone into which the dust accumulates and flows from the bottom, and (3) a gas-outlet tube at the top. Dust-laden gas enters the equipment at a high velocity and as it is forced to flow in a circular path around the annular space the dust particles are thrown outward by centrifugal force. The particles fall or slide downward onto the walls of the cone and even the gas travels downward to the somewhat quiet area of the cone in order to escape upward.

For the separation of 10-micron-size particles from air during a travel of about two revolutions and with a width of gas stream of about 3 ft., an inlet or tangential air velocity of about 240 ft. per second is required. The pressure drop through such a cyclone is large, being about four times the entrance velocity head or about 2 psi. If the design is inferior in that the gas travel is only one-half of a complete revolution, the inlet or tangential velocity must be 1,000 ft. per second and a pressure drop of about 36 psi. is necessary.

The performance of cyclons is affected by the density of the particles, the density of the gas or vapor, and the viscosity of the fluid. In 1934 the investment cost of cyclones ranged from 5 to 30 cents per cu. ft. per minute.

Viscosity of Gasolines

In The Refiner's Notebook No. 93 of May 18, 1946, you show viscosities of many oils but only one gasoline curve is shown. What are the viscosities of gasolines so that we can design a pipe line?—F. G. F.

Data on the viscosity of gasolines were published by W. E. Rea in The Oil and Gas Journal of January 23, 1941, page 38. His data are approximately as follows:

TABLE 1—VISCOSITY (CENTIPOISES) OF GASOLINES

°F.	59.7 A.P.I., .74 s.g.	65 A.P.I., .72 s.g.	70.6 A.P.I., .70 s.g.	76.6 A.P.I., .68 s.g.
30	.83	.57	.45	.36
40	.77	.52	.42	.34
50	.71	.49	.40	.32
60	.65	.45	.38	.31
70	.60	.42	.35	.29
80	.55	.40	.33	.27
90	.50	.37	.31	.26
100	.46	.34	.29	.24

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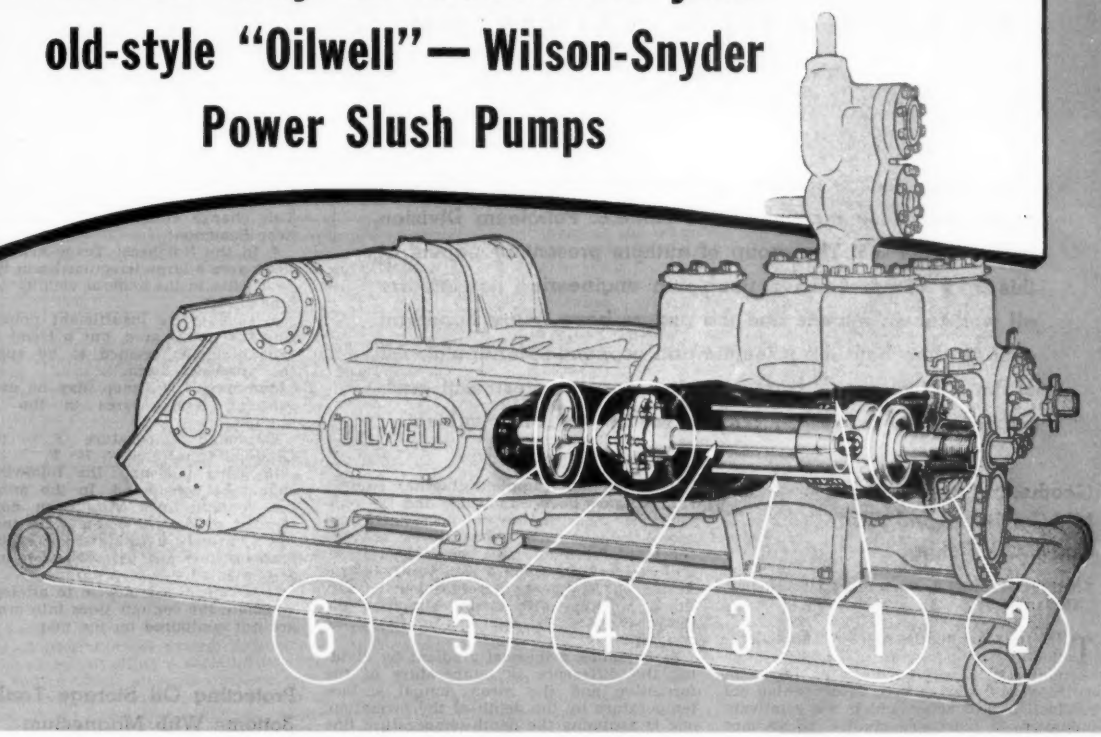

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DIGESTS

A. I. M. E. MEETING, GALVESTON

This special section contains quick-to-read digests of the papers at the Galveston meeting of the A.I.M.E. Petroleum Division held October 3-5. The group of authors presenting papers at this very comprehensive petroleum engineering session are all well-known experts and the papers have many important aspects from both the scientific and economic standpoint. All of the matters covered are of wide current interest, and each paper gives specific information to its particular subject.

Geothermal Gradients in Mid-Continent and Gulf Coast Oil Fields

EARL A. NICHOLS, Core Laboratories, Inc., Dallas.

THE need frequently arises for an estimation of the temperature which will be encountered at a predetermined depth in working with a wildcat or in deepening old production into zones which are relatively unknown. In most past studies, an attempt was made to correlate temperatures in a rather localized area. This paper gives the results of an attempt to correlate temperature gradients over rather large portions of the Mid-Continent and Gulf Coast area.

The data were obtained in conjunction with running pressures in wells or in taking reservoir fluid samples. Glass maximum recording thermometers were used in all but a few instances. The wells had been shut in from 1 hour up to 10 or 12 days. Since the wells were normal producing wells, some of the shut-in times were undoubtedly insufficient for complete thermal equilibrium to have been established and the temperatures measured do not necessarily represent the true earth temperatures. They do represent the temperature conditions which will be encountered in a well which is producing oil. The data, therefore, can be useful in working with or in estimating the temperatures to be expected in producing reservoirs.

In obtaining a thermal gradient by dividing the difference in temperature of the formation and the mean annual surface temperature by the depth of the formation, one is assuming the depth-temperature line to be straight. To conform to the common method, the assumption of a straight-line relation has been used in this paper.

Approximately 1,800 temperature measurements in 194 fields were used in this work. The resulting map of geothermal gradients in oil fields is given in the accompanying figure.

General Comment:

1. It is apparent that the New Mexico-West Texas area is characterized by a low gradient basin which lies in a northwest-southeast direction. The gradients are considerably lower than those of the Gulf Coast area.

2. In the general vicinity of Matagorda Bay a plateau of high temperatures appears with its axis just off shore and parallel to the shore. With the exception of this plateau, the temperature gradients elsewhere along the coast increase as one moves inland. The high-temperature plateau near Matagorda Bay and the increasing temperatures inland form a trough which starts near Corpus Christi, runs in toward Yoakum, and finally moves back out toward the Gulf along the Mississippi Delta.

3. Just above the coast on the Texas-Louisiana boundary line a rather rapid change in the temperature gradients is evident. This change culminates in a high plateau near Beaumont.

4. In the Northeast Texas-Arkansas-Louisiana area a large irregular basin was found which lies in the general vicinity of the Sabine Uplift.

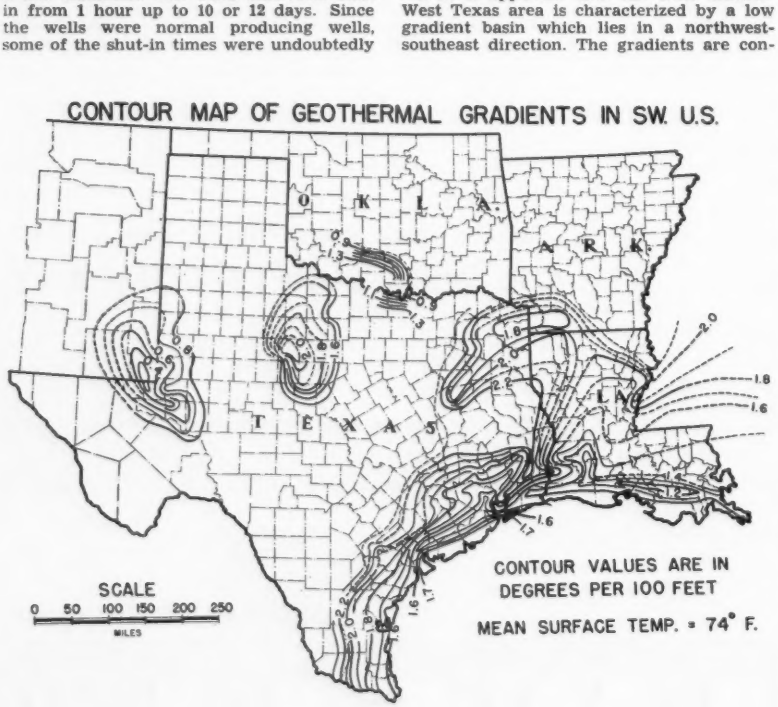
5. There were insufficient points to define the entire area, but a trend in southern Oklahoma seemed to be apparent in the Anadarko basin.

Summary.—The map may be used in estimating temperatures in the following manner:

Estimated temperature °F. — (Depth × Gradient from map) + 74° F.

In using the map, the following points should be considered. In the areas where the contour lines have been dotted, the number of control points were insufficient for accurately defining the position of the gradient lines and they should be used with this in mind.

It is considered unwise to attempt to extrapolate the contour lines into areas which are not contoured on the map.


CONTOUR MAP OF GEOTHERMAL GRADIENTS IN SW. U.S.
O K L A.
A R K.
L A.
T E X A S
SCALE
0 50 100 150 200 250
MILES
CONTOUR VALUES ARE IN DEGREES PER 100 FEET
MEAN SURFACE TEMP. = 74° F.

Protecting Oil Storage Tank Bottoms With Magnesium

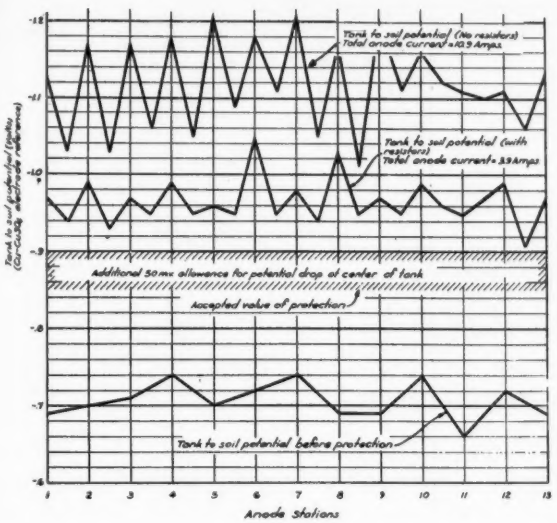
J. R. JAMES and R. L. FEATHERLY, The Dow Chemical Co., Houston, and Midland, Mich.

CATHODIC protection is becoming more widely accepted as a solution to the corrosion problem on buried metal structures. Oil-storage tanks are an outstanding example. The galvanic-anode method employing magnesium anodes furnishes adequate tank-to-soil potential with low installation cost. An additional advantage is that there is no maintenance cost as in the case of the electrolytic-anode type of cathodic protection.

From actual case-history data, it is obviously more logical to spend approximately $25 per year for 10 years of cathodic protection with magnesium anodes than to replace an oil-storage tank at the end of 10 years at a cost of $10,000. Facts like this offer strong evidence in favor of magnesium as a new means which must be considered for the mitigation of the old-age and costly corrosion problem of metal in contact with soil or water.

For another side, the annual loss to our nation's pipe lines by corrosion is estimated at $200,000,000.

The cathodic protection method of buried metal structures is based upon the fact that corrosion occurring in the water or moist soil is largely galvanic in nature. On metal in contact with water or soil, potential differences are set up on various sections of the metal due to different environments in direct contact with the metals or differences in metal composition. This results in a multitude of small batteries with the higher potential areas (anodes) supplying current through the soil or water to the lower potential areas (cathodes). In supplying this current the metal is dissolved or corroded at the anodic areas and eventually the metal structure is perforated at these points. Cathodic protection controls this corrosion by supplying the current demand of local cathode areas with current from an ex-


Tank to soil potential (No resistors) Total anode current = 10.9 Amps.
Tank to soil potential (with resistors) Total anode current = 5.9 Amps.
Additional 50 mv. allowance for potential drop at center of tank
Accepted value of protection
Tank to soil potential before protection
Anode Stations

Curves showing tank-to-soil potentials before and after installation of magnesium anodes on a 20,000-bbl. tank of Republic Pipe Line Co. tank farm at Corpus Christi

ternal source, thus relieving the local anodes of their normal duties. This is accomplished by installing a sacrificial anode in the soil or water at some distance from the corroding structure and setting up a current flow from this external anode through the earth to the metal structure. The over-all effect is to transfer the corrosion from the anodic areas on the structure to an external source which can be replaced much more cheaply and conveniently than the structure which was originally corroding.

The flow of current from the sacrificial anodes to the metallic structure tends to raise the potential of the structure to such a point that all the potential differences are overcome or equalized. Steel normally has a potential of from —0.4 to —0.7 volt when referred to a copper-sulfate electrode. Laboratory and field tests have shown that galvanic corrosion of steel has been checked when the potential of steel referred to a copper-sulfate electrode is raised to —0.85 volt or above.

The amount of current required to reach this potential has been found to vary on the average of 1 to 3 ma. per sq. ft. of steel surface in contact with the soil.

Two methods of applying cathodic protection are used. The "electrolytic" anode method consists of burying an iron or carbon anode in the ground near the structure to be protected and applying an outside source of direct current by means of rectifiers, windmill or motor generator sets, or similar devices. The "galvanic" anode method employs an anode metal which is sufficiently high in the electrochemical series that when coupled with iron it provides its own source of current, thereby eliminating the need for an outside source of power.

Magnesium metal has a number of properties which recommend it for use as a galvanic anode. It has a high anodic potential developing from 0.8 to 1.3 volts (open-circuit voltage) between magnesium and steel. Magnesium has the ability to store or release large quantities of electricity per unit weight, 500 to 600 amp.-hr. per pound of metal having been obtained in actual field practice. Polarization resulting from the formation of current restricting corrosion products, has not been observed on magnesium anodes under the conditions obtained in most soils and waters.

Republic Pipe Line Co. experienced severe corrosion on its oil-storage tanks. One of its 55,000-bbl. tanks had to be replaced at an estimated cost of $10,000 after only 7 or 8 years of service. Magnesium anodes were installed on two 20,000-bbl. tanks and two 55,000-bbl. tanks at the oil-storage tank farm near Corpus Christi. Twenty anodes were installed on 16-ft. centers on the 55,000-bbl. tanks and 12 anodes on approximately 17½-ft. centers on the 20,000-bbl. tanks. The anodes were placed in the holes and surrounded with a wet backfill mixture consisting of 75 per cent bentonite and 25 per cent gypsum. The anode leads were bolted to the base of the tanks. After check measurements, resistors were inserted in the anode leads which reduced the current output considerably and still provided the accepted potential value for complete protection. This reduction in anode current flow increased the entire installation life expectancy from approximately 4 to 8 years.

The data taken on "Welder Station" tank No. 29 is a graphical presentation of the tank-to-soil potential measurements (see cut).

Thirty-six man-hours of labor were required for installation on the 20,000-bbl. tank.

THE AUTHORS

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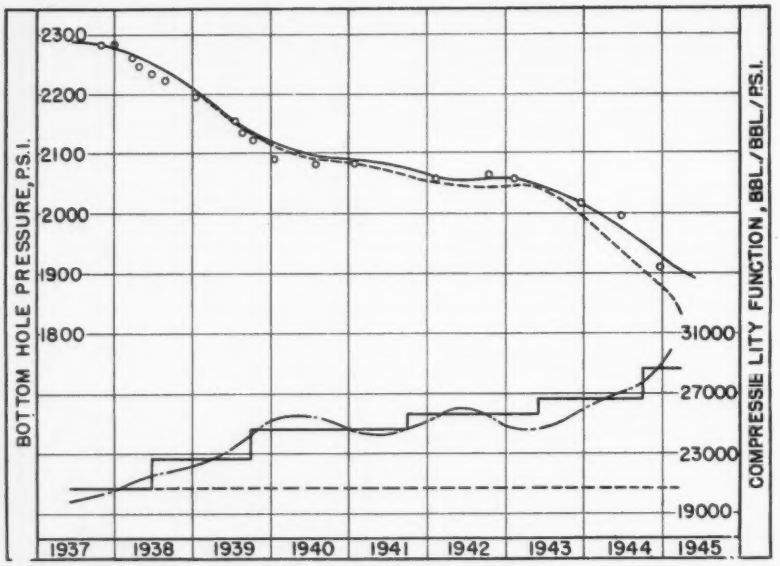
Third row: R. L. Boyer, Gulf Research & Development Corp., Pittsburgh, and Donald L. Katz, University of Michigan, Ann Arbor

Fourth row: S. C. Oliphant and R. Floyd Farris, Stanolind Oil & Gas Co., Houston and Tulsa, respectively

Fifth row: John W. Crutchfield and Horton T. Pruett, consulting petroleum engineers, Corpus Christi

Sixth row: E. M. Frost, U. S. Bureau of Mines, Amarillo, and E. Charles Patton, Jr., Magnolia Petroleum Co., Dallas

Below: Ralph H. Smith and A. C. Polk, Jr., Dowell Incorporated, Houston



Performance of Luby field 5,000-ft. sand. Circled points are measured field pressure. Solid pressure curves from electric analogy with changing compressibility function per step curve; dotted pressure curve from electric analogy with constant compressibility function. Dot-and-dash curve is obtained from calculated values

Extending the Application Of Electric Analogy in Oil Reservoir Studies

HENRY SCHAEFER, Stanolind Oil & Gas Co., Tulsa.

IN electrical phenomena the analogy to two-dimensional fluid flow in a porous media is that of current flow through an ideal conducting sheet. This ideal conducting sheet, perfectly insulated on both sides, has resistance and capacitance uniformly distributed throughout its area, but of negligible inductance.

First step in the calculation of electrical values for the analogy network is the division of the reservoir into "lumps" or blocks preferably regular in shape to simplify calculations but enclosing volumes of nearly equal pressure, neglecting gravity. It is generally convenient to start in the oil-saturated section with the dividing lines following lease lines wherever possible. From the oil section, the dividing lines are then extended out into the water section terminating at impermeable boundaries or outcrops, and with the total number of blocks being limited by the number of condensers and resistors available in the apparatus.

Next, the volume of interstitial fluid multiplied by the applicable compressibility constant is calculated for each block. The value of this product, which will be designated as "compressibility function," is converted into the corresponding amount of condenser capacitance by a scale factor.

Finally, the resistance to fluid flow is calculated on the assumption that the fluid flows from the center line of one block to the center line of the neighboring block. Values of the resistance to fluid flow are converted into corresponding units of electrical resistance by a scale factor.

The electrical network is assembled by connecting one terminal of the condenser that represents a block of porous media through the associated resistors, with one terminal of each of the neighboring condensers. The other terminal of each condenser is connected to a common ground. A current of constant voltage is then applied to the network, charging the condensers until all have reached the applied voltage, at which time the network is in equilibrium.

By means of a sliding switch with sawtooth contacts and suitable electronic control circuits, current is drained from those points in the network corresponding to blocks of the oil saturated section in accordance with the production history of the field. Change in potential at a point of interest in the network is recorded by an oscillograph operating in a high impedance electronic voltmeter circuit and the resulting curve when interpreted in reservoir units shows the change in bottom-hole pressure from the corresponding point in the porous media.

The illustration shows the pressure history of the 5,000-ft. sand at the Luby field in South Texas, which contains crude that was saturated with gas at original reservoir pressure. The circled points are field survey pressures, the solid and dotted curves were obtained by electric analogy with and without fluid compressibility corrections, and the fluid compressibility from material balance calculations is shown as a dot-dash line with analogy compressibility shown by the step curve.

Conclusions

Duplications of past and prediction of future bottom-hole-pressure changes in reservoirs containing gas can be obtained by electric analogy without material balance calculations. A circuit is presented for automatically connecting into the network condensers charged to the correct potential at the moment the connection is made.

Engineering Developments in Southwest Texas

JOHN W. CRUTCHFIELD and HORTON T. PRUETT, consulting petroleum engineers, Corpus Christi.

ABOUT all the different types of reservoir conditions and reservoir drives are encountered in Southwest Texas. However, predominant in number are the fields having multisand conditions. These are characterized by relatively thin oil columns which are overlain by gas caps and/or underlain by water.

One of the principal problems has been the isolation of oil-productive sections in the initial completion of wells. Specific conditions causing completion difficulties include:

1. Low-productivity oil pays where extreme pressure drops are created by high producing rates.
2. Thin sand conditions with gas and/or water-bearing formations adjacent to the pay.
3. Sloughing shale formations which cause irregular hole conditions.
4. Multisand conditions where it is desired to case off the lowest sand encountered and to complete in sands several hundred feet above the casing seat.

Attention has been directed toward improving primary cement jobs. Improvements have resulted from:

1. Controlling hole size before setting casing, through careful control of drilling mud filtration rates.
2. Using wall-scratching and casing-centering devices.
3. Using multistage cementing devices.

Caliper logging of the open hole adjacent to oil sands in certain Southwest Texas fields has indicated that there may be some connection between irregular hole conditions and the quality of primary cement jobs. These fields are characterized by numerous thick shale breaks through the oil sand and which tend to wash out to several times the drilled hole diameter when natural mud is used in drilling through the pay formation. Hole conditions have been improved by resorting to chemically treated mud to reduce water filtration, and improved primary cement jobs have been indicated.

On reservoir work, field engineering committees have been organized in four of the largest fields: Tomoconner, Seeligson, Willamar, and Stratton. The committees coordinate subsurface pressure tests, and joint pressure-production bulletins have been issued at periodic intervals.

Among the industrial and chemical engineering developments in Southwest Texas which have or will have an effect on oil and gas industry of the area are the proposed Carthage Hydrocol, Inc., Fischer-Tropsch plant at Brownsville, and the Celanese hydrocarbon plant at Bishop.

A New Method for Measurement Of Oil Saturation in Cores

R. L. BOYER, F. MORGAN and M. MUSKAT, Gulf Research & Development Co., Pittsburgh.

A RELIABLE and rapid method has been needed to permit the determination of the permeability-saturation curves on typical oil-field cores. Without specific data on the permeability-saturation characteristics of the particular producing rock in question, no quantitative significance can be given to calculations regarding the reservoir performance. This new method for measuring the oil saturation of cores during the course of fluid-flow experimentation depends upon the addition to the oil of a soluble tracer material which is the primary absorber of the X-rays incident upon the core.

Basic principle of the method lies in the measurement of the absorption of X-rays by the core and its fluid content. X-rays are generally considered to be a highly penetrating form of radiation, and indeed, they are transmitted through most materials of low density such as rocks, water, and oil, with little attenuation. Using the ordinary fluids encountered in oil production they would produce such low degrees of absorption in the X-ray beam that

Cameron "Flex-Seals"

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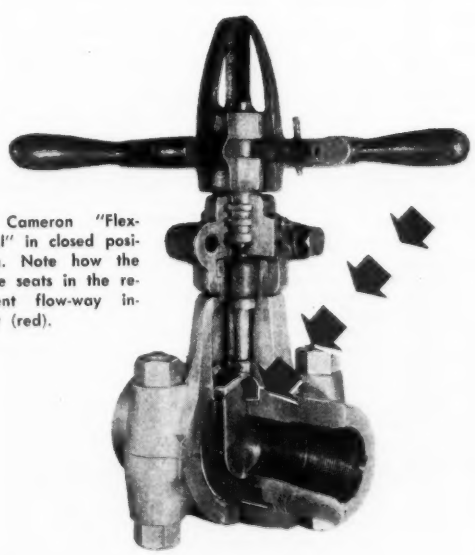

A Cameron "Flex-Seal" in closed position. Note how the gate seats in the resilient flow-way insert (red).

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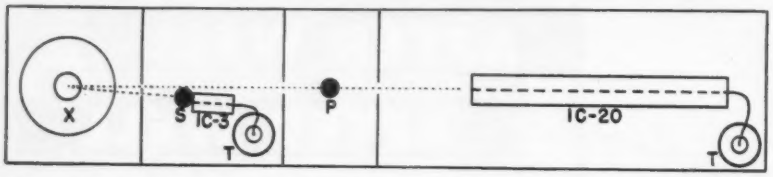

Schematic layout of X-ray tube and ionization chambers. X = X-ray tube; P = test core; S = saturated core or equivalent absorber; IC-20 = ionization chamber for X-ray beam through test core; IC-3 = ionization chamber for X-ray beam through saturated core; T = FP-54 amplifier tube and metal shield

it would be difficult to interpret the measurements in terms of the fluid saturation. Moreover, it would be almost impossible to discriminate between the absorption due to the water and oil phases. If, however, one adds to the oil phase a component having a high absorption coefficient, the absorption due to this additive may be considered as proportional to the amount of total oil saturation present. In this sense, the additive may be termed an X-ray tracer. Actually, however, it has been found that a relatively high concentration of the tracer is necessary, so that the use of the term may be questionable in the sense that it really does not represent simply an impurity in the oil phase. On the other hand, the type of tracer that has been used, iodobenzene, appears to make but little change in the general physical properties of the oil. While the major purpose of the study reported here has been the development of a means of measuring oil saturation in place to facilitate the determination of permeability-saturation curves, it may be observed that the technique so developed has a much wider range of applicability. In particular, it provides means for studying the detailed dynamics of fluid motion within a porous medium. The progress of displacement of oil and gas or water, or the converse, can be followed in detail by scanning with the X-ray beam the fluid distribution along the length of the core in which these phenomena are taking place. Problems of fluid redistribution under the action of gravity can also be studied in this manner. Except for the method of neutron scattering recently described by Brunner and Mardock, there has been heretofore no technique available for the detailed investigation of this type of problem. A schematic layout of the X-ray tube, the plastic-mounted core, and ionization chambers is shown (see cut). The core is supported in a core holder adjustable to various positions in directions normal to the path of the X-ray beam. Two ionization chambers I.C.-20 and I.C.-3 were used. The second ionization chamber, I.C.-3 with its absorber, is used as a measure of the output of the X-ray tube. The ratio of the current in ionization chamber I.C.-20 to that in I.C.-3 is used as a measure of the intensity of the X-ray beams passing through the core of unknown oil saturation. This ratio provides an approximate correction of the intensity measurement for changes in the X-ray beam emitted from the tube target.

The collector electrode of the ionization chamber I.C.-20 is connected to the control-grid of an FP-54 Pliotron tube in an amplifier circuit. The amount of ionization produced by the X-ray beam in the ionization chamber is measured by the change of voltage of the control-grid. This voltage-change is conveniently measured by the use of a potentiometer in the control-grid circuit to restore the galvanometer to zero reading when X-rays produce ionization in the ionization chamber. This potentiometer reading measures the intensity of the X-ray beam in I.C.-20, after passing through the core of unknown oil saturation.

The collector electrode of the ionization chamber I.C.-3 is connected to a similar amplifier and potentiometer circuit. The potentiometer reading obtained for the X-ray ionization in I.C.-3 is a measure of the output of the X-ray tube.

A calibration curve is obtained by measuring the values of X-ray intensity of a core at several values of oil saturation between 0 and 100 per cent, determined by weighing the core at each saturation.

As previously indicated, iodobenzene was used as the X-ray absorbing tracer, and the "oil" was a 25 per cent concentration solution of iodobenzene and mineral seal oil in most cases.

To show the wide range of problems which can be studied by this method, examples were given of several different typical fluid displacement and redistribution experiments. These were: (1) Multiphase flow experiments using the X-ray method to measure oil saturation in the core; (2) effect of gas-flow reversal on oil distribution in cores without connate water; (3) oil and water-flooding of saturated cores, and (4) gas-drive on horizontal cores. While the material presented referred exclusively to the measurements of oil saturations, the authors point out that, in principle, it also is applicable to the determination of water contents of cores.

The method, in principle, also is applicable to the determination of water contents of cores.

A Study of Some Factors Affecting Gun Perforating

S. C. OLIPHANT and R. FLOYD FARRIS, Stanolind Oil & Gas Co., Houston and Tulsa.

A WELL approximately 9,000 ft. deep which was being prepared for abandonment was selected for subsurface tests of gun-perforating experiments. For the experiment, 5½-in. casing in the hole was pulled and racked in the derrick. A test section of pipe, 65 ft. of 5-in. 18-lb. J-55 casing centered inside 7-in. 28-lb. N-80 casing was stood in the derrick corner. The annulus between these two pipes was cemented from the bottom up with 16.5 lb./gal. neat cement. After allowing the cement to harden for a week, the test section was lowered into the hole on the 5½-in. casing to depth of 6,600 ft. by casing measurements. The hole was filled with drilling fluid weighing 10 lb./gal.

A perforating company was called to perforate the pipe, but was not advised that an experiment was being conducted. It was asked to check the total depth (to cross pins in the bottom of the test section), then to raise the gun a given distance and fire a given number of shots with ½-in. bullets, pick up another distance and fire a given number of ⅜-in. bullets, and pick up another distance and fire a given number of ¼-in. bullets.

After the first perforating company completed the job, another concern was called and the same procedure repeated. This was continued until each perforating concern servicing the area had perforated the test section.

The test section was pulled out of the well and inspected. Since it was found that very few bullets penetrated both strings of pipe, and also, since information was desired on the effect of perforator bullets on cement in the annulus at various stages of hardness (strengths), it was decided to repeat the first experiment. However, in this case, the test section was run into the hole immediately after pumping cement into the annulus and the perforating concerns were advised of the nature of the test and specifically requested to perforate for maximum penetration.

A summary of the data relative to penetration of bullets as obtained from the first and second subsurface test is:

TABLE 1—BOTTOM-HOLE PERFORATING EXPERIMENT; 5-IN. 18-LB. J-55 INSIDE 7-IN. 28-LB. N-80

½-in. bullets:	Experiment No. 1 standard shots	Experiment No. 2 best shots
No. of shots fired	31	21
No. went off	25	21
No. completely penetrating both strings	2	15
No. partially penetrating both strings	23	6
⅜-in. bullets:		
No. of shots fired	33	6
No. went off	27	6
No. completely penetrating both strings	5	6
No. partially penetrating both strings	22	..
¼-in. bullets:		
No. of shots fired	17	..
No. went off	12	..
No. completely penetrating both strings	2	..
No. partially penetrating both strings	10	..

The following tabulation demonstrates how the line measurements differed from the casing tally:

Method of measurement	Total depth (ft.)
Stanolind casing tally	6,600
Perforating concern A	6,594
Perforating concern B	6,593.5
Perforating concern C	6,597.5
Perforating concern D	6,599

The error made by each concern in placing the shots after tagging bottom and picking up a given interval was found to be:

Perforating concern	Amount of pickup, ft.	Error
A	13	1 ft. high
B	25	2.5 ft. high
C	37	0.5 ft. high
D	50	2 ft. high

Study of Penetration

Degree of penetration of the perforating bullet is dependent upon many factors. For example:

Powder charge.—For any given gun design on the market, an increase in powder charge will produce increased penetration. However, quantity of powder is much more important to some gun designs than it is to others.

Wet powder.—If the powder in a gun becomes wet with well fluids, penetration of the bullet ahead of it is very apt to be seriously affected regardless of the size of the powder charge. Wet powder is usually caused by faulty fluid seals.

Gun size.—(1) As a general rule, the larger guns are equipped with longer gun barrels or chambers than the smaller guns,

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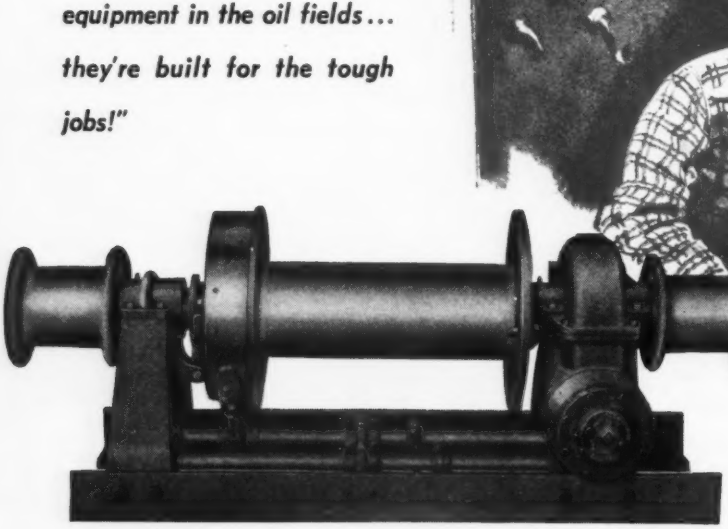

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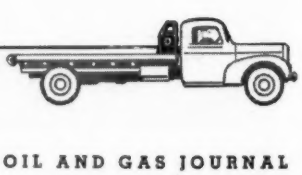


and, all other factors remaining the same, the longer the gun barrel the greater the penetration. For example, an increase in the barrel length of some guns of only ¼-in. will produce a greater increase in penetration than a large increase in powder charge. However, there are other factors which must be considered. (2) Both the subsurface and laboratory tests showed that the closer the gun muzzle is to the casing the greater the bullet penetration. When relatively small guns are used inside 5½ or 7-in. casing the bullets fired from the side of the gun against the pipe may successfully penetrate the pipe and the surrounding cement sheath, but, according to laboratory tests, bullets fired from the opposite side of the gun may or may not effectively perforate the casing. These considerations indicate that best results will be obtained with the largest gun that can safely be run inside the pipe to be perforated.

Bullet shape.—The shape of the bullet nose has a great deal to do with penetration. Flat-nosed or perfect cylinder-shaped bullets produced very low penetration. Other odd-shaped bullets were fired during the laboratory tests, but none equalled the penetration of standard conical and ogival bullets.

Significance of Bullet Striations

Bullets are often found at the bottom of wells inside the casing after perforating jobs. When a considerable number of bullets are recovered the question arises as to whether or not the objective formation has been exposed to the well bore, particularly if a production test has been unsatisfactory. Therefore, tests were conducted to determine if bullets would be striated in a characteristic manner, depending on the type of material they had penetrated. This work showed that bullets fired through pipe and caught in wood would not be greatly marked. Only a slight smoothing down of the tool marks on the nose of the bullet was observed. Bullets fired through casing, neat cement, and into various formations showed deep striations on both the nose and the base of the bullet. These bullets can be used as a reference in making determinations of whether or not bullets which are bailed from wells are likely to have made contact with the formation.

Both the surface and the subsurface tests indicate that casing splitting by perforator bullets may be reduced or minimized by (1) good cement jobs behind the pipe; (2) not perforating the pipe while the cement is too "green;" (3) use of J-55 or N-80 grades of casing, and (4) use of the smallest practicable bullet.

Effect on Cement in the Annulus

Laboratory tests indicated that cement backed up by soft formations shattered more upon perforating than did cement backed up by hard formations. These data indicate the necessity of perforating cement at the proper ages or strength in order to eliminate cracking which might allow entrance of water or gas from below or above the perforated interval.

Use of Plastics in Consolidating Loose Sands in Wells

R. H. SMITH and A. C. POLK, JR., Dowell Incorporated, Houston, Tex.

RECOVERING oil and gas from unconsolidated sand formations offers one of the most troublesome of all production problems. These sands generally present no particular trouble while drilling is in progress, but after the well has been completed and a pressure differential has been established across the face of the producing zone, the formation begins to "slough" resulting in "sanding up" of the well.

Within the last few years a new approach to the problem has been undertaken. This involves the use of plastics which are capable of bonding the individual sand grains in place without materially reducing the effective permeability of a formation. It now is being widely used in many of the more difficult areas on the Gulf Coast of Texas and Louisiana.

Plastics now are being used successfully to control gas-oil and water-oil ratios, in zone isolation, the repair of casing leaks, the elimination of caving in cable-tool drilling wells and in the settling of liners and casing. Sand-consolidating plastics are, however, basically different from all others in that they must not form an impervious seal.

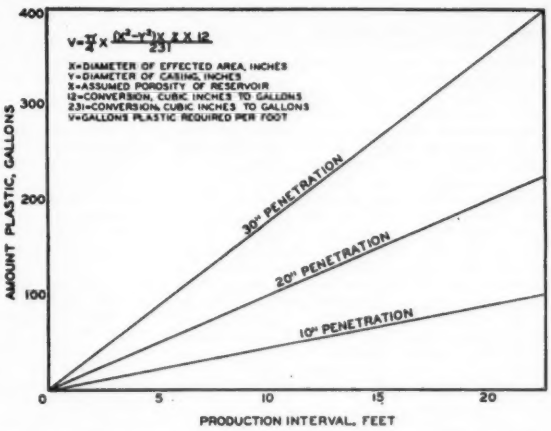


Fig. 1—Assuming a porosity of 30 per cent, the curves indicate plastic gallonage requirements for a well with 7-in. casing. All volumes on the curves are "V" plus the casing volume of the affected section

Properties of Plastics

The basic prerequisites for plastics which can be used in wells for the consolidation of loose sands are that they must penetrate the sand at low pressures, possess adequate compressive and tensile strength

State, pool, prod. horizon—	Bottom-hole temp., °F.	Producing interval, ft.	Plastic used, gals.	Max. injection pres., psi.	Remarks
Tex., Withers, Erie	150	5,522-5,524	105	600	New zone completion. No sand movement following plastic.
Tex., Picket Ridge, Marginulina	132	4,690-4,692	75	2,200	Completed with screen, pumping. Following plastic, natural flow.
La., Erath, Miocene	165	7,731-7,744	250	2,000	Producing 4 per cent sand prior to treatment, no sand following treatment.
Tex., S. Cotton Lake, Frio	156	6,480-6,483	150	1,400	Well sanded up and abandoned. Following plastic, produced on natural flow.
Tex., Cedar Pt., Miocene	135	4,250-4,254	150	2,500	New zone completion. No sand trouble following plastic.
La., N. Crowley, Miocene	150	4,822-4,836	250	1,000	Producing sand prior to treatment, pipe-line oil following plastic.
La., Leeville, Miocene	180	7,770-7,805	330	2,400	Screen sanded up. Now flowing through casing perforations.
Tex., Thompson, Frio	140	5,385-5,391	150	1,075	Originally completed with screen. Following treatment, producing through casing perforations, no sand.
Tex., Lefever, Cole	110	1,759-1,763	150	200	Sanded up. After treatment, pumping 40 bbl. per day.
La., Delta Farms, Frio	160	6,929-6,932	110	1,500	No sand troubles following plastic application.
Tex., Wade City, McNeil	160	4,890-4,906	100	1,000	Producing sand before treatment, pipe line oil after.
Tex., Barbers Hill, Oligocene	145	4,055-4,085	225	1,250	Producing pipe-line oil, natural flow, following treatment.
Tex., Pierce Jct., Frio	145	4,708-4,730	100	1,000	Following treatment, producing 91 bbl. daily, no sand.
Tex., Barbers Hill, Oligocene	135	4,055-4,085	222	1,200	144 bbl. daily production with no sand difficulties, following plastic.
Tex., Barbers Hill, Oligocene	112	4,260-4,290	200	1,250	Producing 155 bbl. daily following treatment, no sand.
Tex., Freer, Cole	107	1,722-1,726	100	200	60 bbl. per day pumping, no sand trouble, following plastic.

in a solid state, and, when solidified, exhibit inherent permeability.

The plastic materials used in sand consolidation are true fluids with chemical and physical properties similar to those exhibited by the plastics used in other oil-well remedial work. However, the sand consolidating materials are unique in that when changing from a fluid to a solid state they become more dense. This decrease in volume results in the development of permeability within the plastic filled pores of the sand body. The plastic is chemically inert under the conditions found in wells, has a specific gravity of .96, a viscosity of approximately 1.5 centipoises and a surface tension of 36 dynes. It is thermosetting and can be successfully applied to wells whose bottom hole temperatures range from 105° to 350° F. The compressive and tensile strength of this plastic material compares favorably with that of the ones which are used in other oil-well remedial work.

Effect on Permeability

Numerous studies made in the laboratory in an effort to plug a consolidated sand core with these plastic materials resulted in a permeability reduction in the order of only 50 to 70 per cent. However, most of the producing sands to which these plastics have been applied often exhibit permeabilities as high as 2 darcys, in which a reduction in permeability of as much as 70 per cent would be of no particular consequence. Actual field production data obtained from wells where friable producing formations have been consolidated with plastic show that the effective permeability usually is reduced by no more than 10 to 15 per cent.

The amount of sand-consolidation plastic required for any job can be calculated readily if the diameter of the well bore, the desired depth of plastic penetration, the average porosity and the thickness of the producing section are known. The formula for making such calculations is given in Fig. 1 along with data on the amount of plastic required for 10, 20 and 30 in. penetration over production intervals from 0 to 25 ft.

Method of Application

In wells where the casing has been set and cemented in place on top of the sand, with a screen set through the sand, the customary practice is either to remove or to gun perforate the screen before applying the plastic.

The actual operation of injecting sand-consolidation plastics into a formation is accomplished by the squeeze technique. (A. C. Polk, Jr., and D. F. Saurenman, Plastics in Well Remedial Work, The Oil and Gas Journal, Vol. 45, No. 2, May 18, 1946, page 154.)

Summary of Results

Since the introduction of the service over 150 wells have been given treatments with this type of plastic. The accompanying table contains pertinent data on 16 wells, typical of results obtained in recent months.

Use of Helium as a Tracer In Oil and Gas Reservoirs

E. M. FROST, JR., Bureau of Mines, Amarillo, Texas

INCREASED use of natural gas for recycling and pressure maintenance has emphasized the importance of a tracer gas such as helium in providing much-needed information on reservoir conditions. Selection of this gas was on the basis of its being chemically inert and not losing its identity.

An apparatus was developed capable of quickly and accurately detecting minute helium content in natural gases and given a series of tests in the Elk Hills field, California.

Prior to the injection of helium into the field, natural gas from the producing wells was carefully checked for helium content. By observation of the time required for helium to travel from the injection well to adjacent output wells, and by determining the concentration of helium in the producing wells, reservoir conditions could be charted with reasonable accuracy between wells.

Helium was injected at Elk Hills in quantities from 0.05 to 0.14 per cent. Time of passage to producing wells varied from 5 to 55 days. (A description of these tests and results also appeared in an article in The Oil and Gas Journal issue of August 10, 1946.) Original data also were obtained from the Bureau's Cabin Creek, W. Va., helium tracer project.

The Cabin Creek project has proved very successful. Presence of tracer gas at the producing wells was quickly and unmistakably detected. The author presents purchase and shipping regulations, and cost of helium.

Material-Balance Method of Evaluating Pressure-Maintenance By Internal Gas Injection in Tight, Volumetrically Controlled Reservoirs

E. CHARLES PATTON, JR., Magnolia Petroleum Corp., Dallas.

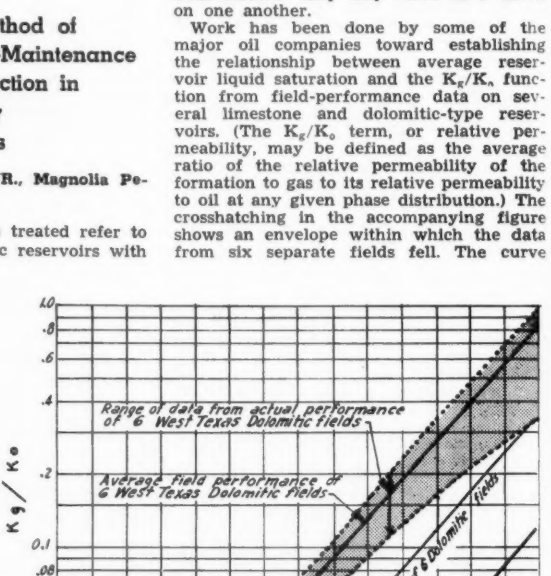
THE types of reservoirs treated refer to limestone or dolomitic reservoirs with no initial free-gas cap, operating primarily under solution-gas drive, and having an average specific permeability to air of the order of 2 to 20 md. A mathematical treatment is described whereby the gas-oil ratio, pressure, and production history can be computed for the types of operation under consideration, and whereby once this history has been computed for any method of operation, these factors can be related to the time element. In addition, there is brought together a logical attack on smaller problems and these are combined into a complete presentation of the solution of a major oil-field problem.

In the preliminary examination for engineering feasibility of pressure maintenance by internal gas injection, if a gas cap is present, the possibility of gas-cap injection instead of internal gas drive should be investigated. Gas-cap expansion is usually thought superior to internal gas expansion unaccompanied by gas-cap expansion because, when accompanied by gravity drainage, it will usually result in greater ultimate recovery. A high degree of gravity drainage normally requires steep dips, low oil viscosity, and high permeability. If there is an active water drive, the possibility of supplementing this by injection of water instead of gas should be considered. However, as in the previous case, reservoirs of the assumed low order of permeability under consideration are not usually accompanied by active water drives. If the reservoir is composed of several alternating permeable and impermeable streaks which themselves are more or less continuous, channeling may result if gas is injected internally.

Data requirements for making an evaluation of pressure maintenance necessitate instituting, early in the life of a field, a systematic process for collecting factual data. The detailed analytical, supplementary, and field data are listed together with the necessary isopachous, structure, and cross-section maps.

Oil initially in place as measured under reservoir conditions, may be found either by the volumetric method or the material-balance method. If enough data are available for reliable determinations by both methods they may serve as a check on one another.

Work has been done by some of the major oil companies toward establishing the relationship between average reservoir liquid saturation and the K_g/K_o function from field-performance data on several limestone and dolomitic-type reservoirs. (The K_g/K_o term, or relative permeability, may be defined as the average ratio of the relative permeability of the formation to gas to its relative permeability to oil at any given phase distribution.) The crosshatching in the accompanying figure shows an envelope within which the data from six separate fields fell. The curve



Relative permeability curves for several West Texas fields, from both actual performance data and laboratory experiments on cores

within this crosshatching is the average of the six curves. The figure also shows that there was a wide discrepancy between these actual field performance data and laboratory data as measured on cores from three dolomitic-type fields, two of which fields were included in this group. No laboratory data were available on the other fields included in the envelope. A study of the work of Muskat and Taylor with regard to the effect of variations in the K_g/K_o curve indicates to the author that the use of the average field-performance curve shown, in place of the actual performance of some hypothetical field represented by either the upper or lower limit of the crosshatching, would result in very small errors in ultimate recovery or gas-oil-ratio performance predictions. However, comparison of the K_g/K_o data used by Muskat and Taylor with that shown also leads the author to conclude that the error in ultimate recovery or gas-oil-ratio performance predictions resulting from the use of core data such as that shown (for primary recovery without the use of a conformance factor), when the actual field behavior followed some curve lying within the crosshatched area, would be quite significant. This divergence, in the critical region, is considerably more than the maximum divergence between the curves used by Muskat and Taylor which resulted in a difference of 7.4 per cent in the calculated value of the ultimate oil recovery.

In continuing the discussion of solving the pressure-maintenance problem in all aspects for a given field, a total of 44 equations are presented, together with the detailed nomenclature symbols used, the definition of each factor, and the units of measurement. As to the evaluation of reservoir performance in relation to time, there are involved the solution of these simultaneous equations: The material-balance equations, the instantaneous produced gas-oil ratio equation, the liquid-saturation equation, the multiphase permeability- saturation relationship, the productivity-index-decline equation, and the oil-production-rate equations. In addition, there are discussed optimum compressor-plant sizes, the number and pattern of injection wells, allocation rates, and unitization bases. Equipment, field testing, and economic evaluation involved in these types of pressure-maintenance projects also are included.

Interstitial Water by the Capillary Pressure Method

O. F. THORNTON and D. L. MARSHALL, The Texas Co., Houston and New Orleans.

SEVERAL methods for determining or for estimating the interstitial water saturation at given points within oil and gas reservoirs are in use. The direct measurement of the water content of cores obtained with non-aqueous fluid in the hole is believed to be an accurate method under most conditions. The water saturation may be calculated by use of the resistivity curves of the electric log. Also, interstitial water saturation of cores can be measured at a capillary pressure such that conditions existing in the reservoir are simulated.

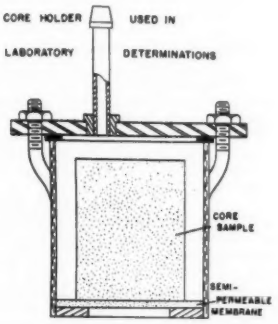
Capillary pressure is defined as the difference in pressure between two contacting fluid phases, such as oil and water. Capillary pressure varies in a given reservoir with depth because of the greater density of the water phase as compared with oil or gas.

The capillary pressure method of measuring interstitial water content consists essentially of placing the core sample in the laboratory under the capillary pressure (computed) existing at the depth from which the core was obtained. The capillary pressure for the laboratory fluid system which is equivalent to that for the reservoir fluids at reservoir conditions may be computed, so that the water saturation of the core as it is believed to have existed in the reservoir can be obtained by direct measurement.

Procedure

The laboratory apparatus for the capillary runs (see cut) consists of a metal cylinder, with a removable pressure-tight cap through which pressure could be applied. The base of the cylinder is closed with a membrane which is permeable to water but impermeable to air at specified pressure differentials. Some of the membranes first used were made of a thin layer of hydrated Wyoming bentonite on oilite bearing metal. Later, porous porcelain plates with high displacement pressures were used.

Cores are cut to convenient size, extracted with carbon tetrachloride and acetone to remove oil, and dried to constant weight over anhydrous $CaSO_4$. The bulk volumes of the samples are measured, and the porosities either determined with a gas-type porosimeter or assumed to be the same as those of duplicate samples previously analyzed. Some of the more friable samples were coated with cellulose acetate cement to prevent their crumbling.



Construction details of laboratory apparatus for the capillary-pressure method of determining interstitial water

The samples are saturated by placing them in water and by then applying a vacuum to the containing vessel. By this method, saturations of 80 to 90 per cent of the porosity were obtained in a short time.

It was found that water of sufficiently high ionic concentration to prevent hydration of clay particles should be used. Erratic results were obtained using a 5 per cent sodium chloride solution, particularly with core samples containing large amounts of clay. In the measurements described herein, formation water which had been filtered to remove iron oxides and treated to kill bacteria was used with satisfactory results.

After the samples are saturated and weighed, they are placed on the membranes in the core holders and a constant air pressure applied through the opening in the top cover. When equilibrium is signified by constant weight of the core sample, the water saturation of the core is computed by difference between the dry weight and the weight of the partially saturated core.

The water phase is continuous from the core through the semipermeable plate, and the pressure on that phase that of the atmosphere. The pressure difference between the air and water phase, or the capillary pressure, therefore, is equal to the gage pressure of the air.

Experimental Results

Table 1 summarizes the results obtained from analyses of twenty samples from a well cored with oil-base mud.

TABLE 1—INTERSTITIAL WATER SATURATION—PER CENT OF POROSITY

By distillation	From salinity	Capillary method	Difference
89	71	74	+3
28	23	23	0
52	37	37	0
29	34	33	—1
53	36	38	+2
73	61	61	0
36	28	28	0
82	59	59	0
44	32	27	—5
19	20	19	—1
47	44	40	—4
44	38	38	0
30	25	24	—1
27	23	24	+1
35	29	27	—2
36	34	25	—9
38	37	35	—2
33	34	34	0
36	34	26	—8
32	28	30	+2
—	—	—	—
43	36	35	—1.3

Values in Table 1 for the interstitial water saturation of each core were obtained: (1) By retort distillation at above 400° F.; (2) by calculation from the salt content (obtained by titration) of the core and known salinity of the reservoir water; and (3) by the capillary pressure method.

Table 2 summarizes results obtained by the capillary pressure method applied to core samples from a well compared with results calculated by the method of G. E. Archie, from the long normal resistivity curves.

TABLE 2—INTERSTITIAL WATER SATURATION—PERCENT OF POROSITY

Electric Log method	Capillary method
19	*19
11	†11
10	‡8

*Average of five samples. †Average of four samples. ‡Average of seven samples.

Plots of interstitial water versus specific permeability for samples from the two wells above are given. Both correlations show a general trend, although there is considerable scattering. The average curves shown for the two wells show different values for water saturations of cores with the same permeability. This emphasizes that permeability-water saturation curves should not be used indiscriminantly to estimate water saturations in a given reservoir.

In some instances where interpretation of the electric log is difficult, the capillary metnod may be used to "calibrate" interpretation of the log.

Electric logs usually are available for all wells and show the entire section, while core samples usually are not available from many wells and core recovery seldom is complete. It therefore is suggested that the capillary pressure and electric-log methods may be used together to advantage in determining the distribution of water in some reservoirs.

Phase Relations of Hydrocarbon-Water Systems

JOHN J. McKETTA, JR., University of Texas, Austin, and DONALD L. KATZ, University of Michigan, Ann Arbor.

RECENT experimental data on the methane-n-butane-water system have been combined with data in literature to present (a) the water vapor content of natural gases; (b) the solubility of water in hydrocarbon liquids, and (c) the solubility of natural gases in water.

Since water is present in petroleum reservoirs, experimental data regarding the behavior of water in hydrocarbon-water systems are of increasing engineering importance. A literature survey shows that data of these type are fragramentary at temperatures above the hydrate region. Experimental data taken from the author's recent investigation of the methane-n-butane-water system are presented. The compositions and specific volumes of the coexisting phases were determined in the three phase region and two phase region at temperatures of 100°, 160°, 220°, and 280° F. and pressures to 3,000 psi. Correlations of these data with those in the literature are presented to provide methods for predicting the behavior of naturally occurring hydrocarbon-water systems.

Water Content of Natural Gas

The experimental data presented by Dodson and Standing relating to the composition of the coexisting vapor and liquid phases in the natural gas-water and natural gas-brine systems constitute the most complete source of published information concerning the behavior of heterogeneous systems consisting of hydrocarbons and water at elevated temperatures and pressures. Several papers report the water content of the hydrocarbon phase in equilibrium with water. The data of these papers are in substantial agreement as to the water concentration at given temperatures and pressures.

The investigation of the methane-n-butane-water system established that the composition of the hydrocarbon phase was a variable in addition to temperature and pressure. The data of Reamer, Olds, Sage, and Lacey for the methane-water, ethane-water and n-butane-water systems are in complete accord.

At temperatures lower than 220° F. the methane-n-butane-water includes dew-point gas or vapor phases having molecular weights as low as 21. The water content of these gases could have been interpolated from the methane-water and the ethane-water compositions at the same temperature and pressure; the authors present the smoothed results of the methane-n-butane-water system at four temperatures, including lines for various molecular weights.

Reservoir water normally contains dissolved salts which reduce the concentration of water in the equilibrium gas phase. The correction for brine concentration, from Dodson and Standing, is given for gases over brines having 8,600 and 34,000 parts per million of sodium chloride.

Solubility of Water in Liquid Paraffin Hydrocarbons

There has been only a small amount of data presented in the literature regarding the solubility of water in liquid paraffin hydrocarbons. This is especially true in case of hydrocarbon liquids with molecular weights of less than 100. No data were found on the water content of condensates or crude oils containing dissolved gases. The experimental results on the solubility of water in the hydrocarbon-rich liquid phase of the methane-n-butane-water system are presented in tabular form, along with data from the literature.

Water dissolved in hydrocarbon condensate may be a vital factor in the corrosion occurring in the tubing of condensate wells. From this research, one would expect the water content to range from about 0.1 mol per cent at 100° F. to about 1 per cent at 200° F., with only minor effects due to pressure in this temperature range.

Natural gas is much less soluble in water than in hydrocarbon liquids. Nevertheless, natural gas does dissolve in water and the ability of reservoir waters to dissolve gas is of interest. Solubility of natural gases in water taken from the literature and this research is given.

Effective Technical Group Speaking

A. ROSS ROMMEL, Humble Oil & Refining Co., New Orleans.

THE material featured is the master outline followed in the presentation of a training program on group speaking to engineering personnel of Humble Oil & Refining Co.

1. Ability to speak effectively is one of man's most-longed-for and coveted abilities. It is the ability to stand on one's feet, transfer knowledge and thoughts to others, to reach an objective professionally or otherwise by leading groups through a channel of planned thought.

2. Each day group speaking plays an important part in making or marring success.

3. The engineering profession often provides this opportunity and requirement.

4. The ability to speak effectively develops courage, poise, confidence, and prestige for the speaker.

5. The technical man cannot be reluctant to face an audience. He is often called upon to do this in presence of employes, supervisors, and other groups. The ability to speak effectively is as much a requirement as the fundamentals of his profession.

The three fundamentals of effective speaking are:

1. Enthusiasm and confidence.—This means sincerity, correctness, and clarity through diligent preparation.

2. Preparation.—Preparation is parallel to knowledge of the subject. The speaker should not prepare until he knows his objective. A speaker with a purpose knows where he is going after he has decided his objective.

Preparation is the careful assembly of thoughts, ideas, convictions, urges, and knowledge. It means brooding, recollection, imagination, and reflecting the speaker's personality.

The less dependent on an outline for actual reference, the better the talk. Notes are helpful and can be written on cards, scratch paper, or any medium which allows quick reference. They should not contain the entire speech.

3. Presentation.—In reality, group speaking is merely expanded conversation for the purpose of communication. It commands attention to win audience response, and speech effectiveness is directly proportional to the worth of the speaker.

The author, in continuance, outlines and discusses many helpful points involved in the different ways to open a speech, ranges of expression, use of repetition and pauses for emphasis, posture, gestures, means of maintaining interest, ways to encourage audience participation, and controls of discussion.

BOOKS

STANDARD PRACTICES FOR STATIONARY DIESEL ENGINES. Published by Diesel Engine Manufacturers Association, 1 North LaSalle Street, Chicago, 157 pp. $2.50.

This edition brings to the diesel-engine industry up-to-date information on such topics as engine construction, horsepower ratings, speed regulation, torsional vibration, intake and exhaust, cooling-water systems, lubricating oil, fuel oil, generators, selection of engine sizes, power-plant buildings, erection of engines, field tests, and specifications. The editorial board consisted of nine engineers whose work was checked, rechecked, revised and finally put into polished form.

WHERE TO FIND INFORMATION ON THE GERMAN CHEMICAL INDUSTRY—A Bibliography of German Technical Information. By L. Wilson Greene, Chemical Corps Technical Command, U. S. Army. Part 1. $1.00. From author at 54D Oak Grove Drive, Baltimore.

This volume is prepared to aid those interested in finding data on German chemical developments, from and in the hundreds of reports which have come into this country since V-E Day. The bibliography is divided into two sections, the first giving a numbered and titled list of published articles, the second a listing of the most important reports which have been made on the German chemical industry. The list includes 40 pages, in which is added nearly seven pages of subject index. A similar bibliography is planned for early issuance, on the German metallurgical industry.

Hard-Rock Drilling

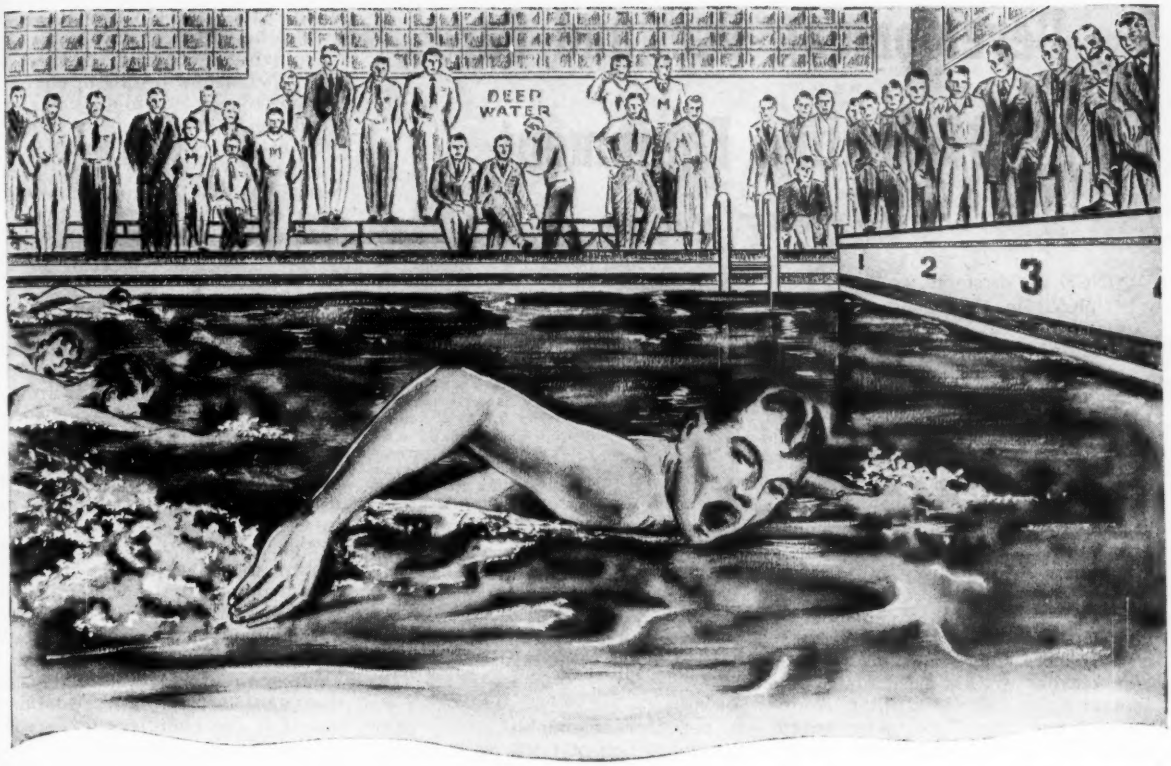
(Continued from page 79)

joint is working. The ironing-out process, of course, tends to loosen a joint. Various metallic platings such as copper and zinc have shown good resistance to galling, especially in the tender breaking-in period when new connections are made up. A properly tinned shoulder using "half and half" solder is also good protection against galling.

Another source of connection trouble seems to lie in the disposition of the pin with respect to its service as a driver or a driven member. Stated simply, more wobbling failures seem to happen when the pin points up (box drives pin), than when the box points up (pin drives box). This phenomenon of mechanics can be called "planetary action," since friction drive between pin and box threads tends to rotate the pin faster than the box. When this happens, the pin will make up tighter when it is pointing down, but if the pin points up the connection tends to loosen and even come entirely unscrewed despite the fact that drill stem torque could be expected to prevent such action. Wherever possible, it is wise to use a tool joint pin pointing down. The same rule applies for both right hand and left hand connections.

To our knowledge, the first printed record on planetary action is contained in an article by John T. Hayward, in the May 28, 1931, issue of The Oil and Gas Journal. His experience confirms that of others. The drillers even have a name for it. They call it a "wabble off."

Directional surveys of holes in California, Wyoming, and Canada indicate that the majority of holes tend to drift "into the hill" or "up structure." Perhaps it would seem wise to hold up weight on the bit when it begins to run roughly, to allow time for removal of the cause for deflecting the hole. In areas where the formation bedding planes lie horizontally, little trouble is experienced. Perhaps the same conditions existing in "flat" country to preserve straight hole are also those which tend to deflect the well bore from vertical in slanting formations.



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Development, Use, and Care Of Drilling Equipment

by Fred F. Murray

SINCE the first oil well was completed in 1859, there have been great improvements in drilling methods and in the machinery with which to do the job. The Drake well was brought in at only 69½ ft.; today men drill 3 miles into the earth to find oil. As the average drilling depth has increased from year to year, better tools have been a prime necessity. Toward the end of the war and since improvement in drilling equipment, has attained a rapid pace, with both manufacturer and user fully recognizing the difficult problem of economical exploration to the deeper horizons.

The increasing cost of this search for oil has greatly accentuated the demand for heavier drilling equipment, yet more portable equipment, in order to minimize moving and rigging-up costs. The necessity for such equipment is acknowledged by all of us, but our efforts to solve this problem have been only partially successful to date.

What, then, are the mutual problems to be faced by the user and the manufacturer? What responsibilities should each assume in a partnership to reduce cost of drilling deep wells?

It is the manufacturers' responsibility to recognize a need for new or improved equipment and to arrive at a practical solution in terms of the best engineering practice. Users are in the best position to know where present equipment falls short and to foresee needs for new equipment. For this reason, from the very beginning of the drilling business, manufacturers have looked to the users of equipment to establish the need for improvements and to assist in engineering and developing those improvements.

Responsible manufacturers maintain close contact with their own and customers' field men to avail themselves of suggestions for the design and manufacture of equipment to perform specific functions. Each month some ingenious tool or improvement is introduced to shorten the time of some operation or lighten some manual burden. Such developments are usually a composite of ideas which were originated by experienced field men of both the user and the manufacturer.

Manufacturers welcome ideas for improvement, but of course cannot utilize every idea suggested. In order

The author of this paper, given at the Drilling Contractors' annual meeting held this week at San Antonio, is president of Oil Well Supply Co. He is a director of the A.P.I., a member of A.I.M.E. and A.S.M.E. He graduated from Stevens Institute of Technology with a degree in mechanical engineering. In 1929 he was made vice president of the Wilson Snyder Manufacturing Co., Pittsburgh, and was elected vice president of Oil Well and moved to Oil City, Pa., that year when the former concern was acquired by Oil Well. In 1936, Murray moved to Dallas when general headquarters of the company were transferred there from Pittsburgh.

to permit a reasonable selling price in anticipation of fairly wide acceptance, manufacturers must at all times strive to produce a standard product to meet the common needs of a large segment of the oil industry. If equipment is tailor made to meet individual needs which are not generally subscribed to, then costs are increased, often to the extent that they are uneconomical both for the user and for the manufacturer.

Details About Rotary Equipment

Manufacturers often wonder whether or not operators fully appreciate the amount of time, effort, and money required to design and develop a major item of rotary drilling machinery.

For example, a new mechanical deep drilling rig recently made available to your industry consumed a total of 20,000 man hours in design and drafting room preparation, not including consultations, research, and investigation. A total of 1,800 detailed drawings were required by the plant to produce the component parts; and there were hundreds and hundreds of pages in the bill of material.

This is only the beginning! For every major piece of equipment there are many intricate patterns to be made before castings can be poured. Numerous jigs and fixtures must be prepared to assure duplicate manufacture and interchangeability of parts. Actual manufacture includes many operations—precision machining, subassembling, inspecting individual component parts and subassemblies—all before final assembly and factory running test. Equipment is then ready for field proving ground.

The importance of field testing should be emphasized. Any arrangement for factory testing of equipment cannot be expected to duplicate actual field conditions, which vary depending upon territorial conditions encountered and which include peculiar variations in the human equation. This fact was illustrated during the war when materials which had undergone exhaustive tests at various government proving grounds were found to need further perfecting after use in combat.

Proper use and care of machinery and equipment are vital factors in deriving maximum benefits from the improvements which have been developed through the cooperation of operator and manufacturer. Again the responsibility is a joint one, but here it is necessary for equipment users to assume the greater share.

The importance of properly determining the range of use anticipated before purchasing new equipment is generally understood. In the design of new equipment, limits of mechanical loading and expected service from the equipment are determining factors that must be definitely established, and it is the manufacturers' responsibility to recommend mechanical load limits governing applications. Equipment properly designed will have an adequate factor of safety to assure long life and freedom from difficulty under recommended conditions of service, and it is not economical to operate equipment far beyond rated capacity. Manufacturers should cooperate with operators in providing proper precautionary notices so that operating crews will be fully informed of design limits and capacity ratings. Strict adherence to manufacturers' ratings will increase the satisfactory performance life of equipment and reduce maintenance costs.

Another important factor in the care of equipment is orderliness. There is more incentive to care for a clean rig and frequently expensive repairs can be avoided by the early discovery of some defect presaging a failure.

The importance of proper lubrication in this day of high speed, close tolerances, and precision fits is an old story. Manufacturers should be diligent in their efforts to furnish complete lubricating specifications for their equipment, preferably on nameplates in a conspicuous location.

Properly funcioning gages and other indicating or protective devices play an important part in the economical operation and maintenance of equipment and should be repaired or replaced when inoperative. For example, a shear relief valve on a mud pump, when the specified size nail is applied in relation to the liner size, not only protects the pump, but also protects the manifold piping, the rotary hose, and all interim fittings.

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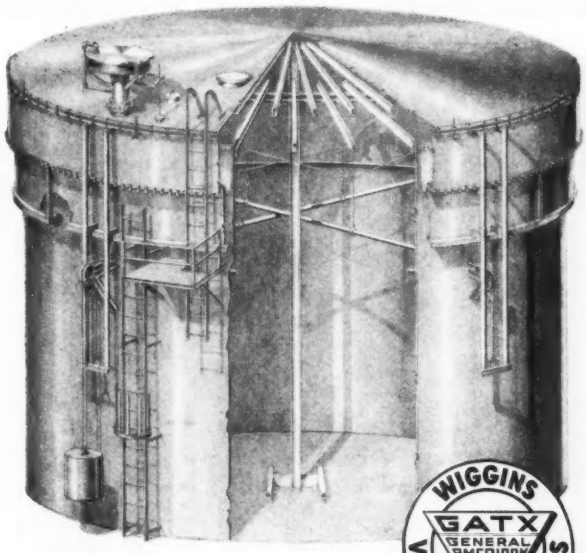

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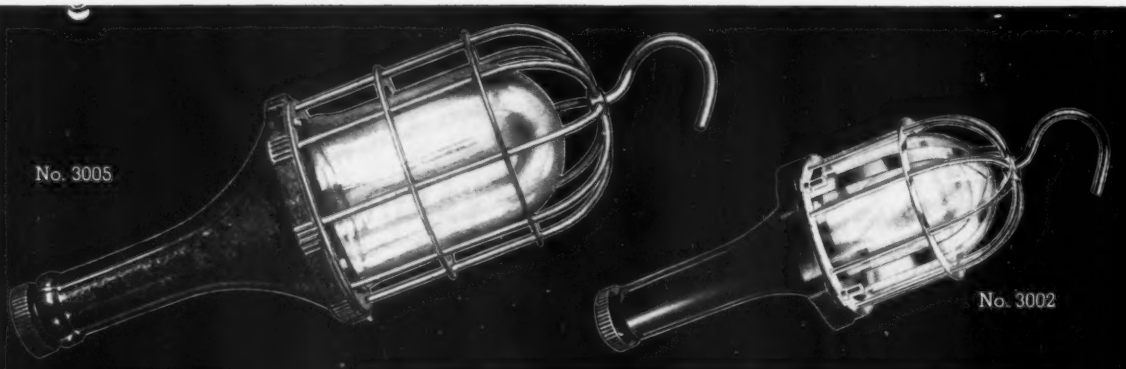

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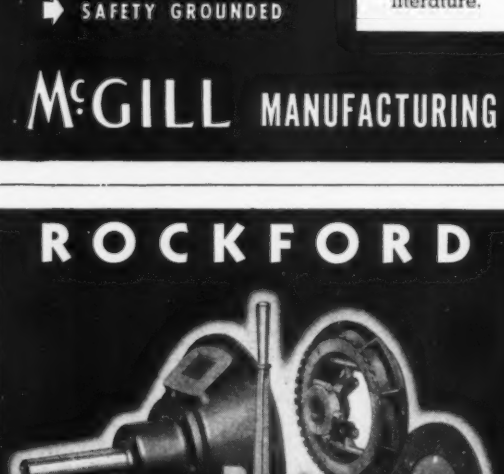

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The excerpts below are taken from a letter recently received from Mr. J. E. Elliott, consulting geologist, of Austin, Texas:

". . . Much to my surprise, I found that the drillers and crews took immediate interest in the visual record, and that the drillers made constant reference to it, using it as an aid in drilling practice, and particularly as aid in forming their written log, which naturally was more accurate than any 'drillers' log' compiled in the usual manner.

"In addition, the Geograph record was a great aid to the geologist, and allowed him to spend more time in observing other important factors of drilling and sampling.

"Finally, I wish to state that I feel the Geograph is one of the important accessories that should be on every well, and in the future, I will always insist on its use on any well that may be under my supervision."

(signed) J. E. ELLIOTT.

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Prevention and Removal Methods

(Continued from page 71)

satisfactory methods do exist for carbonate removal, it follows that prevention of these deposits is not equally as necessary as prevention of the hard scales. Experiences have proved, however, that most carbonate scales may be prevented more cheaply than they may be removed.

Attention should be given again to the chemical reaction which is the essential cause of the "acid soluble" scales.

$$Ca(HCO_3)_2 \rightarrow CaCO_3 + H_2O + CO_2$$

The reaction may be retarded by maintenance of pressure, thus avoiding loss of CO_2, by reduction of temperature and to some extent by preventing severe agitation. The reaction is stopped entirely, or even forced to the left by addition of CO_2 while maintaining pressure or by the addition of various acids to lower pH value. An understanding of the reaction led to the earliest and most commonly used method of prevention, i.e., pressure maintenance and avoidance of undue aeration. Experience with salt-water-disposal systems showed that the water became "unstable" following pressure release but that appreciable adhering deposits did not form if aeration and agitation were prevented. The "closed system" arrangement of waste brine injection has resulted in enormous savings to operators in western Kansas in comparison to maintenance costs of open systems or those of complete clarification by aeration and filtration. Numerous examples are known of successful prevention of clogging in waste water lines merely by the simple expedient of excluding air. Usually, the clogging material was found to consist of just sufficient $CaCO_3$ to cause it to be troublesome and elimination of this relatively hard component allowed scrapers to be run. Also, in such cases the brine is not ordinarily the type which becomes extremely "supersaturated" following slight aeration.

Waste brines of the type occurring at Luling, Tex., and Hobbs, N. M., are so highly charged with calcium bicarbonate that pressure, sufficient to prevent $CaCO_3$ deposition, cannot be maintained during production. The situation in the fields near Hobbs became so acute during September 1940 that Gulf Oil Corp. began a very interesting and important field experiment. A short time previously it had been announced that sodium hexametaphosphate, in quite small amounts, effectively prevents $CaCO_3$ deposits from industrial waters.[11] The effect of this compound on precipitation of $CaCO_3$ from oil-well brines was not known and such effect could be only approximated by laboratory tests. It was decided to introduce the metaphosphate continuously into the annulus of a well which had quite severe trouble from tubing scale. The metaphosphate solution was adjusted with caustic and sodium chromate to protect the casing against possible corrosion. The lubricator feed was adjusted so that a metaphosphate concentration of approximately 23 mg. per liter was provided in the effluent brine. This is slightly less than 1 lb. of chemical for each 100 bbl. of brine produced. The treatment accomplished entirely satisfactory results. Prior to the treatment, operating expense due to the scale formation was $3,440 for 33 months. For the first 12 months following treatment the scale expense was $7. No further scale trouble was reported for 3 years, or during the remaining life of the well. As a result of this field experiment, the use of metaphosphate for scale prevention has been expanded enormously. Several major oil companies report about 75 per cent, or better, success for the method in the fields occupying the area from Jal to Hobbs, N. M.

Recent investigation of the effects of various molecularly dehydrated polyphosphates have shown definitely variable results, depending on the particular polyphosphoric acid compound and the nature of the water. Certain of these recent investigations have culminated in the charting of required dosages of the various phosphate compounds, with or without organic dispersive agents, for prevention of $CaCO_3$ precipitation in waters of varying dissolved solids content.[12]

In general summary of scale problems and their solution, it should be concluded that no two deposits have ever been found identical in chemical or physical characteristics. Thus each deposit presents individualities which may be explained only after thorough attention to all attendant conditions. A generalized method for the identification of scales was outlined in the preceding article on this subject (The Oil and Gas Journal, September 28, 1946). Following identification of a given scale accumulation, it is believed that consideration of the foregoing discussion and study of the particular problem will invariably result in reduction of operating expense due to such accumulation.

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FM Radio Takes to the Oil Fields

(Continued from page 64)

is kept at each rig, showing time, parties to, and nature of each communication.

Licensing Prospects Uncertain

The prospects for license allocations are clouded at the present time, due to the fact that FCC is now reallocating practically all frequencies. Prior to a year ago, the petroleum industry received no particular recognition as a specific group and applications for licenses to operate radio networks were considered together with all other industries and individuals. It is recognized now, however, that the petroleum industry is unique in its requirements and merits an exclusive band of channels in which to operate. Accordingly, a frequency band from 25 to 30 megacycles comprising 12 channels is presently set aside for the power and petroleum industries, although even that large classification is further broadened to include "other industries requiring similar service."

Apparently pending final action on channel assignments in this 25-30 megacycle range, FCC has issued licenses to Paine Drilling Co. and four or more major oil companies, to operate provisional stations in the band from 31.02 to 39.54 megacycles. This band, including nine channels, is set aside in the commission's present rules for provisional stations which are licensed on a temporary basis not to exceed 1 year. In issuing such provisional licenses, FCC reserves the right to revoke or reallocate frequencies without prior notice.

Despite the probability that members of the petroleum industry will receive consideration commensurate with their importance in industry at large, there is still an uncertainty as to just how many channels may be available for their use. This and the transitory nature of licenses presently issued should warn interested parties to consider carefully their future prospects before investing in equipment.

Improved Fluid Catalytic Cracking Unit

(Continued from page 72)

The points most severely damaged were the cyclone separators in the regenerator and in the lines which carried the catalyst to and from regenerator and reactor. Minor erosion also was encountered in the reactor and in the slurry system. Other elements extremely vulnerable to erosion were the slide valves which controlled the rate of flow of catalyst in the wartime units.

Intensive study was devoted to the solution of erosion problems. Remedies were sought, found, and applied successfully. The remedies included wear plates, special cements, and others. With units protected against erosion by these methods it was possible to make long, continuous runs with comparatively few shutdowns and those of relatively short duration.

For example, one 4,000-bbl.-per-stream-day unit had an on-stream average of 93 per cent during the last 17 months of the war. Another wartime unit, charging 18,000 bbl. per stream day of heavy California gas oil, has been on stream continuously for 275 days and no necessity for shutdown is indicated.

Alloy Lines; Separators

Use of these erosion preventives and others will be incorporated in the design of the latest type unit, thereby eliminating the early difficulties that hindered continuous operation of the wartime catalytic cracking units.

Instead of using the brick or fabricated lining which was employed in the older units for the lines carrying hot catalyst, it is proposed to use alloy lines where they are required by temperature considerations and carbon-steel lines where they are permissible.

After experience in operating two of the wartime plants where these improved lines were used, it was found that erosion was practically nonexistent. This experience also demonstrated that the actual layout of the lines is important, to assure that the catalyst flows fairly smoothly and that there are no points where high-velocity eddy currents will be encountered.

The smallest commercial cracking unit now in operation, which is shown in an accompanying photograph, is provided with lines of 4-6 chrome alloy and with carbon steel. This unit has been in operation for approximately 2 years without any replacement of catalyst lines and with a minimum of repairs.

A 12,000 bbl. two-stage unit located in the Persian Gulf was provided with the same type lines as the smaller unit and no erosion was discovered when it was shut down at the end of the war.

In the design of the latest-type catalytic cracking unit, full advantage has been taken of all these findings. Lines have been designed to assure relatively smooth flow and to make them most resistant to erosion. It has been established that of all common materials of construction, carbon steel is the most resistant to catalyst erosion. The next best material is 4-6 chrome alloy.

In the older units, as before stated, a good deal of trouble was caused by rapid wear of the cyclone separators, particularly those located in the regenerator. Due to the stress of wartime operation and the necessity for making maximum quantities of aviation gasoline, the velocity through the regenerators was frequently higher than anticipated, with the result that the loading of catalyst to the cyclones was excessive.

At the same time, in all of the early units, the operating pressure in the regenerator was substantially atmospheric, which again caused the catalyst loadings to be high. The improved U.O.P. unit will operate under pressures of the order of 10 psig., so that the amount of catalyst carried over to the cyclones will be relatively low.

In many of the early units the type of cyclones used was not conducive to long life, although it has been demonstrated that even this type will give reasonable life if more cyclone capacity is provided.

The velocity through the cyclones was found to be higher than allowable, and the increase of capacity to reduce the velocity has been found to increase materially cyclone life and efficiency. Furthermore, the cyclones proposed for the latest unit are of a type which has been found to be more successful in other commercial operations.

The type of catalyst utilized also has a relation to the amount of cyclone wear and other ravages of erosion in the unit. The microspherical type of catalyst used in the improved unit does not possess the cutting power which was present in the ground type used earlier in the development of the fluid process.

A relatively less important source of difficulty in the early units was the erosion of the slide valves which control the rate of flow of the catalyst. Due to lack of information on the properties of the catalyst, the slide valves were of such size that they would permit the full flow of catalyst with low differential pressures.

In actual operation it was found that the differential pressure through the slide valves was considerably higher than required, with the result that the valves operated in an almost entirely closed position. This resulted in a high rate of wear. The valves in the early plants were remodeled to give a much wider opening and more wearing surface, and it is considered that the slide valve problem has been overcome satisfactorily.

In spite of the design limitations in the older fluid plants it has been possible to make runs up to 300 days. With the improved units it can be expected that because of the elimination of erosion the amount of work to be done during a shutdown will be relatively small and the shutdown time will be decreased accordingly, greatly improving the on-stream efficiency.

It is therefore reasonable to expect that the record of over 90 per cent on-stream time set by some units can be obtained with the improved-type unit.

Isomerization and Isoforming—Pentane

(Continued from page 82)

bers respectively. This figure indicates the relatively high space rates that can be employed as well as the undesirability of very low space rates.

As in other processes involving the deposition of coke on catalyst, provision must be made to periodically regenerate the catalyst by burning off the coke, which may be done by conventional methods, although the requirements for coke burning are small, because of the low coke production in the process. The isoforming process is applicable both to fixed-bed and the fluid operation, the above results being derived from fixed-bed pilot-plant operations.

Future Applications

It is true that the justification of processes for the improvement of octane numbers of straightrun and thermally cracked gasoline has been made somewhat more difficult by the recent large increase in the catalyst cracking capacity which has substantially improved the octane rating of cracked gasoline. In addition, the advent of the hydroforming process of which considerable capacity was built just prior to the war period furnishes a means of attaining octane ceilings on straightrun gasolines with far less loss than was possible previously. The future of isomerization of normally liquid hydrocarbons primarily for the purpose of octane improvement of motor-gasoline constituents will depend upon a number of factors which include individual refinery situations and the prospective levels of motor gasoline octane.

The isomate type of process can be operated at a cost of 0.7 to 1.0 cent per barrel of reactor feed[2] and when

applying to straightrun paraffinic gasolines is stated to be competitive with the use of tetraethyl lead only on low-quality feed stocks consisting mainly of normal paraffins. In mixed pentane-hexane feed stocks, it is also stated[2] not to be competitive with tetraethyl lead at present octane levels although comparable to other methods of raising quality above the limits possible with conventional refining processes.

Straightrun gasoline having the lowest octane constituent of total gasoline production, nevertheless, presents a possible field for all processes for octane improvement, and it is possible that with increase in octane levels and future emphasis on production of processing losses, processes of the isomate type may find a definite place in the refinery economy. Correspondingly, the processes for improvement of the octane number of thermally cracked gasoline by isomerization may also find application for the same reason. No figures are available on investment or operating costs of the isoforming process, but its justification will depend on individual refinery situations and the economics of the various alternates.

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BOOKS

THE METALLURGY OF STEEL CASTINGS. By Charles Willers Briggs. 633 pp., 334 illustrations. McGraw-Hill Book Co., New York. $6.50.

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Protection from Plant Poisoning

by Henry W. Boggess*

ALMOST all field personnel in the exploration, producing, and pipeline branches of the oil industry are exposed to plant poisoning. Some individuals appear more allergic to the poisons of certain vegetations than do others; also it seems a matter of individual idiosyncrasy as to the severity of the poisoning.

The most common types of poisonous vegetation are, (1) poison ivy, (2) poison oak, (3) poison sumac.

It should be understood that it is not necessary actually to touch poison ivy or oak with the skin in order to have a good case of irritation. These plants secrete oily substances which may be airborne considerable distance from the location of the plant; particularly is this true when the vegetation is being burned and the smoke carries the oily substances.

The first precaution against infection by poisonous plants is to be able to recognize them. The accompanying drawings show the recognizable characteristics of the three most common types. Poison ivy and poison oak always have clusters of three leaves; there is no need to fear rank vines with clusters of five leaves.

The second step in preventing cases of skin poisoning would be by means of immunizing the individual from harmful effects. The medical profession has not yet approved any safe and efficient drug capable of making an individual immune to oily vegetable posions, even though one well-known West Coast laboratory has a prepared drug which is widely used and reported as harmless and effective.

Three common types of poisonous vegetation are illustrated here. The cut below shows poison ivy; top right shows poison oak, and bottom right shows poison sumac

*Superintendent of Employment-Insurance-Safety Department, Sinclair Prairie Oil Co., Tulsa.

SAFE field PRACTICES

The third step is proper care on the part of any one exposed to these poisons which should eliminate or at least minimize irritation. Inasmuch as poisoning develops within 6 hours as a minimum from time of contact, it is necessary that the poisonous oils be thoroughly removed from the skin after each exposure. Bathe with soapy water and permit soapy lather to dry on the skin before final rinsing. In this way, and if done within 6 hours of time of contact, infection is improbable.

As a first-aid treatment, it is a good idea to wash irritated skin with soap and water and to follow up with rubbing-alcohol rinse and an application of calamine lotion, available at any drug store. Commonly used also is a 5 per cent solution of ferric chloride in equal parts of alcohol and water; solution of hyposulfite of soda—1 tablespoon to a pint of water and applied four or five times a day. Regardless of burning, stinging, and itching discomfiture—don't scratch the skin—see a doctor.

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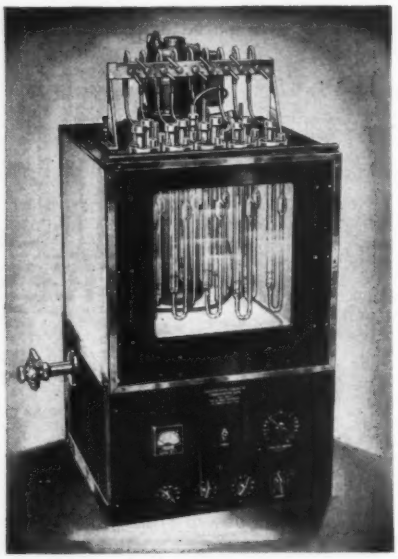

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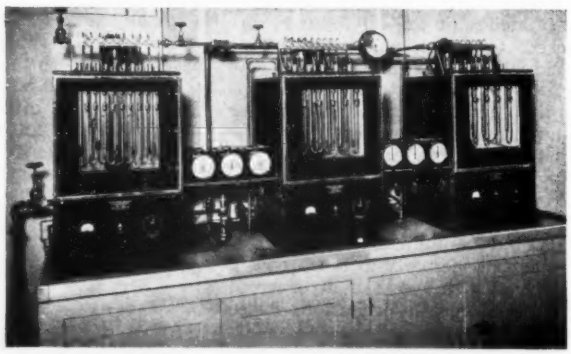

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A FEATURE OF THE OIL AND GAS JOURNAL

Stretch of Sucker Rods (Continued)

Pumping speeds. — In order to understand how the pumping speeds affect the stretch of the sucker rod it is necessary to review some of the fundamentals of elementary mechanics. Mechanics deals with two phases of engineering; one of these is called statics, which is devoted to the conditions of equilibrium of bodies. It requires primarily the measurement of forces and lengths. The other field of mechanics is known as dynamics, which deals with bodies that are in motion. It is based primarily upon the natural laws that influence the motion of bodies under the action of given forces. Dynamics requires in addition to the measurement of force and length the measurement of time or the duration of the period during which the forces act, while statics is not concerned with time.

Any particle moving along the line O to X in Fig. 1 will at some time have reached the point M, and the distance O to M is called the displacement. It varies in some manner with the time, i.e., its position at any instant is some function of time. Hence as the particle

Fig. 1

moves along the line O to X, the motion is fully described if the displacement at any given instant is known. The relation can be expressed mathematically as the general displacement-time equation, thus:

$$x = f(t) \qquad (1)$$

where x is the displacement from the central position, and the symbols f (t) mean "some function of time." This function can be a simple proportionality, or a more complex function, such as some power or exponent of the time, as will be shown shortly. The precise form of the equation depends on the kind of motion of the particle. If the motion is uniform along a straight line the equation becomes:

$$x = v\,t \qquad (2)$$

where v is the velocity and t is the time.

If the particle already has an initial displacement, before the velocity is imparted to it, the equation takes the form:

$$x = b + v\,t \qquad (3)$$

where b represents the initial displacement.

It should be noted that the above Equations 2 and 3 become identical if the initial displacement is zero, but both of them express in mathematical form uniform linear or rectilinear motion.

A third and very important type of motion is that where the displacement is represented by some power of the time, commonly its square, as shown by the following equation:

$$x = k\,t^2 \qquad (4)$$

where the constant k is the result of some force that produces a constant change or acceleration in the velocity. This type of equation finds its most general application to the motion of freely falling bodies, and the constant k is equal to half the acceleration, or change in velocity per second, due to the force of gravity, usually designated by "g."

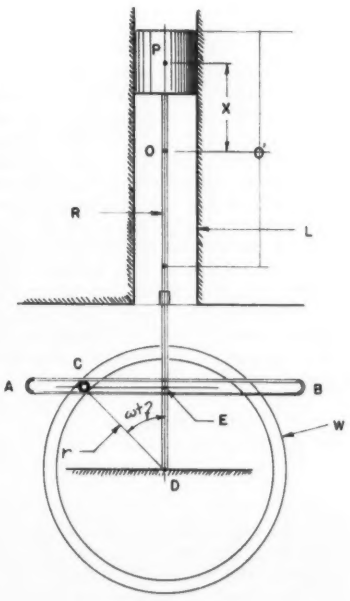

Fig. 2

Another important engineering type of rectilinear motion results from the change of circular motion to linear motion, or vice versa, such as takes place with a piston driven by a circular flywheel, or the reverse. In Fig. 2 the slotted bar **A — B** engages a pin **C** attached to the rim of a flywheel **W** that is operated by some driving mechanism. The center of the bar **A — B** is connected by means of a rod **R** to a piston **P** in cylinder **L** so that the uniform circular motion of **C** is transformed into a vertical or up-and-down motion of the piston **P.** This special type of motion is characteristic of all reciprocating pumps, and most vibrating bodies, and is called simple harmonic motion. It will be seen from Fig. 2 that the velocity of the piston **P** becomes zero as the pin **C** reaches the top and bottom positions and has a maximum velocity where **C** is 90° from either of these positions. If the velocity of the point **C** be expressed in radians per second (a radian is the length of the radius expressed in degrees, and is equal to approximately 57.3°), then the product of the velocity multiplied by the time will give the angular distance passed through during that time interval. The equation for the motion of point **C** is:

$$\text{Angular distance} = \text{angular velocity} \times \text{time} = \omega\,x\,t \qquad (5)$$

where omega (ω) is the constant angular velocity in radians per second.

Frequently the engineer is more concerned with the motion of the piston **P,** whose displacement from the central position can be found by taking the cosine of the angular velocity multiplied by the time, and multiplying the result by the radius of the circle or flywheel along whose circumference the point **C** moves. This is true because the radius r is the hypotenuse of the right triangle **CED** whose side **DE** adjacent to the angle "angular velocity multiplied by time" is equal in length to the displacement. The latter is also equal to x, the motion of the piston **P** during the time interval represented by t, thus:

$$x = r \cos \omega\,t \qquad (6)$$

The engineer is also concerned with the forces which cause change

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, University of Kansas

in velocity, since force itself is defined as "capacity to produce changes in the state of rest or motion of a particle." However, the rate of change in velocity is acceleration of a particle. The relation between force and acceleration was defined by Newton in his Second Law, which states that "The acceleration of a given particle is proportional to the force applied to it, and takes place in the direction of the straight line along which the force acts."

Galileo was the first person to show the relation between the gravity force W and the acceleration g. It is a necessary conclusion from Gallileo's work and the Second Law of Newton that if some other force F should act on a given particle, then the acceleration produced by the force F must be in the same direction and have the same relation to the known acceleration g as F is to W. Hence:

$$\frac{F}{W} = \frac{a}{g} \qquad (7)$$

from which

$$F = \frac{W}{g} a \qquad (7a)$$

which is known as the general equation of motion. W/g is sometimes called the measure of sluggishness with which a particle yields to action of an applied force; it constitutes a measure of the inertia of a particle. It is also called the mass of the particle, usually designated m, so that the above Equation 7a may be written:

$$F = m a \qquad (8)$$

In uniform rectilinear motion the acceleration is zero; for cases like those of Equation 6, the acceleration becomes:

$$a = -r \omega^2 \cos \omega t \qquad (9)$$

Since the maximum value of the function "cosine ω t" is +1 at the angle 0° and —1 at 180°, the maximum acceleration must also occur at the top and bottom of the stroke of Fig. 2. Hence the acceleration becomes $-r\omega^2$ at the top of the stroke and $+r\omega^2$ at the bottom of the stroke.

It is customary in oil-field practice to express the pumping speed as the number of revolutions per minute (r.p.m.) (or number of upstrokes per minute) so that it is necessary to convert r.p.m. into radians in order to make use of the above equations. Since 1 r.p.m. is equal to 2π radians per minute, multiplication of the number of r.p.m. by 2π and division of the result by 60 changes r.p.m. into radians per second thus:

$$\omega = \frac{2\pi \text{ r.p.m.}}{60} \qquad (10)$$

The equation for displacement (Equation 6) then becomes:

$$x = r \cos \left(\frac{2\pi \text{ r.p.m.}}{60}\right) t \qquad (11)$$

The maximum acceleration as shown by Equation 9 and the paragraph following it where the maximum values of the cosine are + and —1 for 0° and 180° respectively, becomes:

$$a_{max} = -r \left(\frac{2\pi \text{ r.p.m.}}{60}\right)^2 (\pm 1) \qquad (12)$$

Equations numbered 6 to 12 inclusive are those which are particularly applicable to pumping problems. Thus if the maximum acceleration occurs at the ends of the stroke, then from Equation 7a the maximum forces encountered during a pumping cycle will also come at the ends of the stroke, thus bringing into play the maximum dynamic loads which the rods must carry. Therefore the greatest elongation of the rods should occur at the bottom of the stroke where maximum positive acceleration occurs and maximum shortening (known as overtravel) at the top of the stroke where maximum negative acceleration occurs. By substitution of Equation 12 in 7a, and of one-half the polished-rod stroke for r, (s/2) of Equation 12, then Equation 7a becomes for dynamic load:

$$F = W \left(\frac{2\pi \text{ r.p.m.}}{60}\right)^2 \times \frac{s}{2g} \qquad (13)$$

where length of stroke s is in feet, g is in feet per second per second and W is the weight of the rods in pounds. If the length of the stroke is expressed in inches, as is commonly done, then g must be multiplied by 12.

The total static and dynamic load for the rods alone would then be:

$$F = W + W \left(\frac{2\pi \text{ r.p.m.}}{60}\right)^2 \times \frac{s}{2g} \qquad (14)$$

$$= W \left[1 + \left(\frac{2\pi \text{ r.p.m.}}{60}\right)^2 \times \frac{s}{2g}\right]$$

The expression $\left(\frac{2\pi \text{ r.p.m.}}{60}\right)^2 \times \frac{s}{2g}$ is called the impulse factor by some engineers and the acceleration factor by others.

Some practice is necessary in the use of the equations for conversion of r.p.m. into radians.

Problem 1.—If the crank of the pumping unit has a radius of 24 in. and is operating at 30 r.p.m., (a) what is the velocity of the crankpin in radians per second? (b) in degrees per second? (c) in inches per second?

Answer.—(a) One revolution is equal to 2π radians; hence by Equation 10, angular velocity or velocity of the crankpin $= \frac{2\pi 30}{60}$ $= \pi$ rad./sec. (b) Angular velocity in degrees per second = 3.1416 × 57.3° = 180°/sec. (c) Angular velocity in inches = $\pi \times r$ = 3.1416 × 24 = 75.4 in./sec.

Problem 2.—What is the maximum acceleration in the above problem, expressed in inches per second?

Answer.—Use Equation 12, and substitute the values of the cosines of 0° and 180°, which are +1 and —1, respectively.

$$\text{At top of stroke, } a = -24 \left(\frac{2\pi 30}{60}\right)^2 \times 1 = -24\pi^2 \text{ in./sec./sec.}$$

At bottom of stroke,

$$a = -24 \left(\frac{2\pi 30}{60}\right)^2 (-1) = 24\pi^2$$

in./sec./sec.

Footnote: The structural features of the oil-field pumping unit are such that the simple harmonic motion assumed in the above discussion is only approximated; nevertheless the fundamental principles are as indicated.

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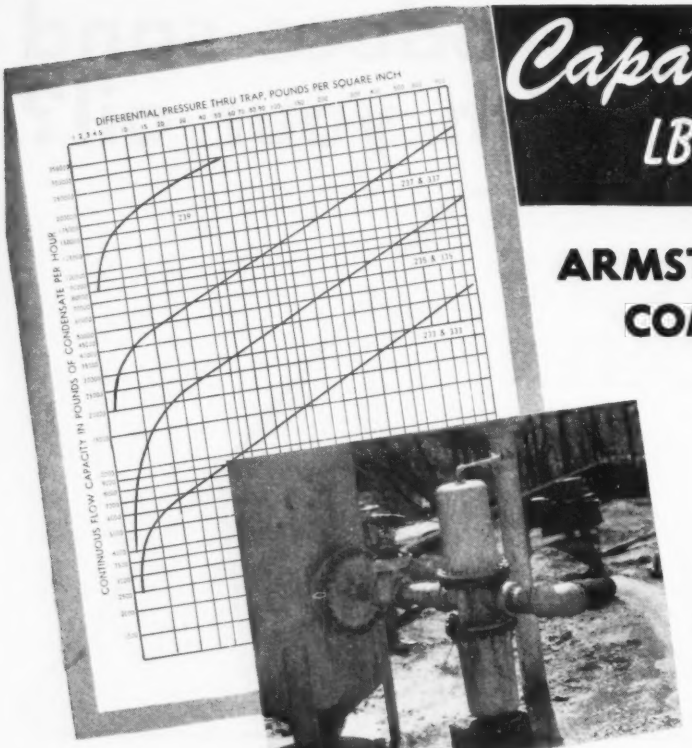

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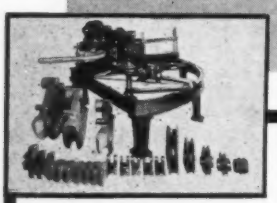

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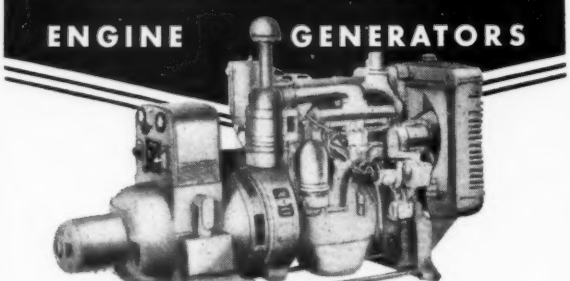

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Heat Balance of Pipe Stills

TENTATIVE SCHEDULE OF TOPICS

No. 109, September 7, 1946—Return Bends and Tubing
No. 110, September 14, 1946—0°-50° A.P.I. Table
No. 111, September 21, 1946—Allowable Radiation Rates
No. 112, September 28, 1946—Heat Absorbed in Radiant Section
No. 113, October 5, 1946—Heat Balances of Stills
No. 114, October 12, 1946—Equivalent Value of Fuels
No. 115, October 19, 1946—Tube Diameter and Strength
No. 116, October 26, 1946—Fuel-Oil Properties

A HEAT balance is an accounting of heat quantities. The heat that enters a process in the form of heat energy in the fuel is accounted for as it leaves the process. It may usefully heat the feedstock, it may remain in the flue gases and be lost through the stack, or it may be lost through the furnace walls and soil. In a more general way the disposition of the heat may be considered as (1) **useful heat** and (2) **wasted heat.** All of these quantities are usually expressed as percentages of the heat input.

Net heating value.—The heat generated during the combustion of a fuel is measured by burning the fuel with air and determining the amount of heat by cooling the flue gas back to the original temperature. Water vapor is produced in the burning of the hydrogen in the fuel and as the flue gases are cooled back to room temperature the water vapor condenses. The condensation liberates a large amount of heat (1,058 B.t.u. per pound of water vapor) and hence the regular **gross** or **higher** heating value represents both cooling of the flue gases and condensing of the water vapor contained in it. This is unfortunate because condensation of water from the flue gas does not ordinarily occur in pipe stills or boilers. For this reason it is customary to calculate the heat of condensation of water vapor and subtract this amount of heat from the gross heating value. The lower figure so obtained is known as the **lower** or **net** heating value. Both gross and net heating values are in The Refiner's Notebook No. 105, August 10, 1946.

Heat input.—Ordinarily the only heat input to a pipe still is the **net** heating value of the fuel. In addition a small amount of heat may come into the combustion space with the steam used for atomizing an oil fuel. Finally, heat may be introduced as air preheat or by the recirculation of hot flue gases but such operations are less and less common.

Stack losses.—Heat that is lost up the stack can be easily obtained from the combustion charts of Notebook No. 107, August 24, 1946. However, to use these charts it is necessary to decide upon the amount of excess air to use and the stack-gas temperature. Less than 25 per cent of excess air can be used when burning gaseous fuels but oil fuels require more excess air. The average amount of excess air used is about:

Gaseous fuels	35%
Oil fuels	50%

Stack temperature is directly related to the temperature of the incoming stock; it should be 250°-400° higher than the feedstock temperature. A lower stack temperature increases the thermal efficiency but it enormously increases the size of the convection section and the cost of the pipe still. Thus for various feed temperatures the stack losses should at 40 per cent excess air be about:

Feed (°F.)	Stack temp. (°F.)	Stack loss (%)
200	450	12
400	700	19
600	950	26
800	1,150	32

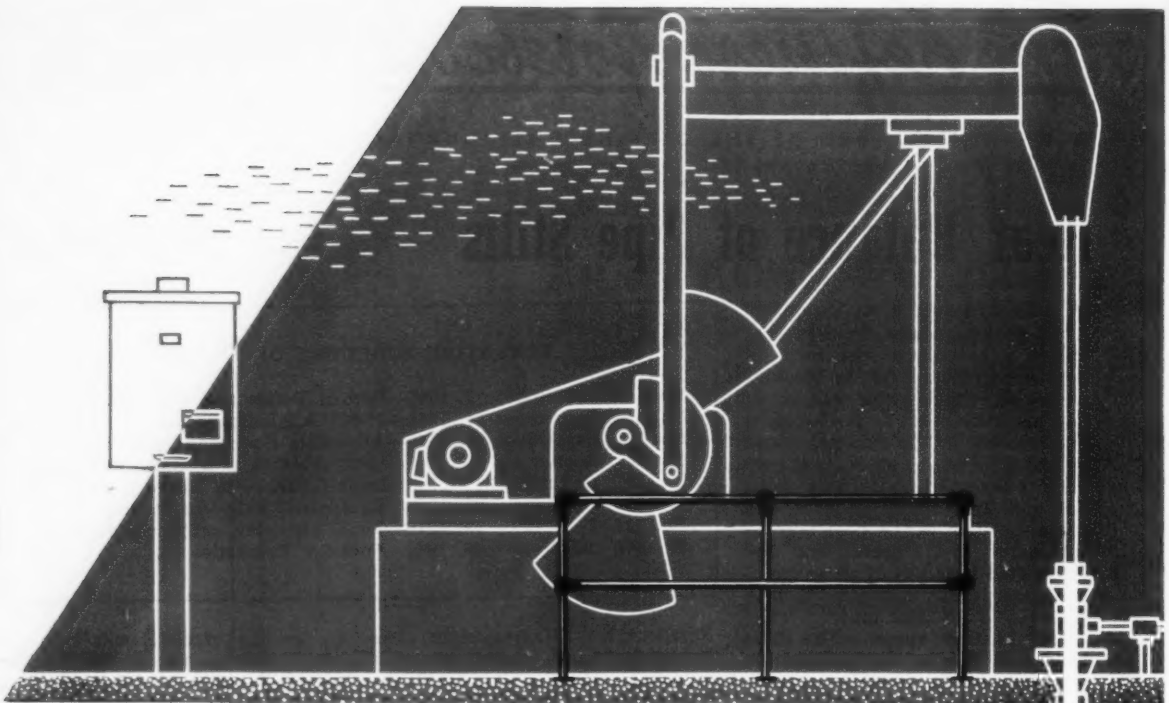
Wall losses.—In new stills or ones in which the walls are kept in good repair the losses through the walls, floor, and roof range from 3 to 5 per cent. The large losses occur in high-temperature stills and in designs in which tubes do not cover much of the wall surface.

Useful heat.—The useful heat is considered as radiant-section heat and convection-section heat. The percentage of heat absorbed in the radiant section can be computed by the use of Notebooks Nos. 111 and 112, September 21 and 28. The allowable radiant absorption rate (Notebook No. 111) depends upon the kind of stock and the operation contemplated. Having decided upon an absorption rate, the percentage of heat absorbed in the radiant section can be taken from the chart of Notebook No. 112. This involves selecting an approximate tube size and center-to-center spacing for the return bends. The rest of the useful heat (or efficiency) is absorbed in the convection section.

Example.—The crude oil to a topping still is available at 300° F. and it is to be heated to about 600° F. Gaseous fuel is available. The still is to be a double-upfired type in which all walls except the small ends are covered by radiant tubes. The stack loss at 300° plus 300° or 600° F., with 30 per cent excess air, will be about 16 per cent (Notebook No. 107). The wall losses will be about 3 per cent. This makes an efficiency of 100 minus 16 and minus 3 or 81 per cent. Notebook No. 111 indicates that a rate of 36,000 B.t.u. per sq. ft. of projected area may be contemplated for this service. If the bend spacing is twice the tube diameter and when using 30 per cent excess air, the percentage of radiant absorption, according to Notebook No. 112, is about 50 per cent. The following tabulation summarizes the above:

Stack loss	16%
Wall losses	3%
Radiant pickup	50%
Convection pickup (by difference)	31%
Total	100%

No. 113 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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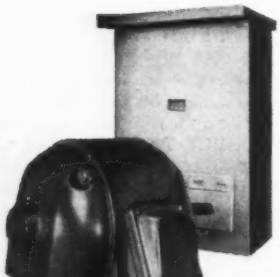
G-E electric pumping equipment enables you to establish almost any pumping cycle without fuss or bother. You merely set a simple timing device. The G-E electric pump motor control does the rest. Pump motors start and stop at exact intervals with uniform speed and pull. Your pumping cycle can be adjusted to avoid pulling excessive water or uncovering the sand, and thus endangering the reserves underlying your fields.



G.E. has motors that are well suited for outdoor pumping service. They can be given adequate "slip" to cushion the shock of reciprocating pump motion. G-E control incorporates automatic timing and important motor protective features as well as weatherproof construction and operating safety.

Electric pumping helps you make better use of manpower, too. Beyond an occasional checkup, no supervision is necessary. Men formerly tied down to pump "watching" can be assigned to more important work. Electric pumping has shown time and again it can boost oil well yield. Why not discuss its potentialities in your case with a G-E engineer? *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

MOTORS AND CONTROL *for Oil-Field Service*

GENERAL ELECTRIC

654-60

NATURAL GAS

Cabot Carbon Buys U.S. Plant at Guymon, Okla.

Cabot Carbon Co. was disclosed last week to have bought from the War Assets Corp. the carbon-black plant at Guymon, Okla., which the company operated during the war.

Capacity of the plant is 1,250,000 lb. monthly. It operates on sweet gas obtained from the Guymon-Hugoton area of Kansas and Oklahoma. The purchase price of $550,000 included 20 houses built by the Government for plant employes. The plant was built in 1943-44 at a cost of $1,250,000.

Although the Oklahoma Corporation Commission has held the use of sweet gas for channel-process carbon manufacture constitutes waste, the Guymon plant was given an emergency order by the commission for the war emergency and 6 months thereafter.

North Missouri Utilities Protest Gas Limitation

JEFFERSON CITY, Mo. — A gas-limitation proposal of Panhandle Eastern Pipe Line Co. last week met opposition from the Missouri Public Service Commission and a group of north Missouri gas utilities.

The plan to limit daily gas delivery to any purchasing utility to 110 per cent of the previous peak day was proposed by Panhandle Eastern in a rate schedule submitted to the Federal Power Commission in Washington. Representatives of the distributing utilities estimated gas consumption this winter would be far above any previous peak and said the limitation would hamper home building and industrial expansion.

The utilities and the Missouri commission were expected to place their objections before FPC at a hearing October 14 in Washington. The rate schedule filed by Panhandle Eastern was another development in a long-pending case resulting from a 1942 FPC rate-reduction order.

Gas Laboratories Honored For War Contributions

CLEVELAND, Ohio.—R. M. Connor, director, American Gas Association Testing Laboratories, has been awarded a certificate of recognition by the American Standards Association, honoring the work of the association in the development of standards for Army and Navy equipment and procedure. Basis of the award was for promoting interchangeability of repair parts, sponsoring better procedures and higher standards of manufacture, resulting in considerable savings and contributing to victory.

Hearing Set on Three Gas-Transmission Projects

WASHINGTON.—Three major middlewestern gas pipe-line projects—those of Cities Service Gas Co., Mid-Continent Gas Transmission Co. of St. Paul, and Northern Natural Gas Co.—will be considered by the Federal Power Commission in a hearing set for October 28 in Kansas City.

The applications of the three companies have been consolidated for the hearing. Cities Service has requested authority from FPC to build a 26-in., 405-mile gas transmission line from western Kansas to the Wichita and Kansas City areas at a cost of $23,000,000.

A somewhat similar line, plus an extension to the vicinity of St. Paul, Minn., has been proposed by Mid-Continent. Cost of the Mid-Continent project is placed at $78,853,500. Extensive additions to its existing system from Texas northward to Minnesota and South Dakota has been proposed by Northern Natural. Cost of this program is estimated at $12,715,931.

Second-Quarter Natural-Gas Sales Drop 2.2 Per Cent

NEW YORK. — Natural-gas revenues for the second quarter of 1946 totaled $159,852,800, a decline of 2.2 per cent from $163,413,100, a year earlier, according to American Gas Association.

Revenues from the sale of natural gas for residential use totaled 85,177,300 for the second quarter, an increase of 0.9 per cent over $84,412,000 in the same 1945 quarter. Commercial natural-gas revenues were $15,259,800, a decrease of 5.6 per cent from $16,166,100 in the like period in 1945. Industrial natural-gas revenues were $57,005,200, a decrease of 3.6 per cent from $59,149,700 a year earlier.

Total customers using natural gas on June 30, 1946, numbered 9,171,000, a gain of 3.5 per cent over 8,859,000 natural-gas customers June 30, 1945. Natural-gas sales for the second quarter amounted to 508,140,900,000 cu. ft., a decline of 5.0 per cent, under 535,011,600,000 cu. ft. sold in the second quarter of 1945.

Total revenues from the sale of all types of utility gas to ultimate consumers in the quarter ending June 30, amounted to $282,033,900, a gain of 0.6 per cent over revenues of $280,436,500 in the same quarter of 1945, the association reported.

Revenues from the sale of residential gas totaled $177,232,100, an increase of 3.6 per cent over revenues of $171,155,600 in the like 1945 quarter. Commercial-gas sales revenues were $32,593,100, an increase of 1.4 per cent over $32,139,100 a year earlier. Industrial-gas sales revenues totaled $72,208,700, a decrease of 6.4 per cent from revenues of $77,141,800 in the June quarter of 1945.

Natural Gasoline

Prospects Better for LPG Tank-Car Supply

The outlook for tank cars for the liquefied-petroleum-gas industry appears to be somewhat improved with cancellation of the Government's proposed sale of 45 leased cars.

Several companies engaged in LPG manufacture and marketing protested several weeks ago when the Government prepared to sell the 45 cars to Commercial Solvents Co. for use in the program of reconverting explosive plants to fertilizer manufacture.

At the time, the companies, including Phillips Petroleum Co. and Warren Petroleum Co., pointed out the 483 cars built by the Government and leased to LPG shippers represented the only expansion allowed the industry during the war and that the need for cars is now greater than at any time previously.

Exactly how many tank cars will be produced by the end of the year to relieve the shortage is a point of disagreement between government and industry officials, but a special allocation of steel to high-pressure tank-car manufacturers has been announced by the Office of War Mobilization and Reconstruction. Tank-car manufacturers indicated their maximum production would be about 300 cars, against the 700 predicted by OWMR.

Another factor in the situation is the efforts of Howard D. White, executive vice president of the Liquefied Petroleum Gas Association, to speed the turn-around time for the cars. White is asking government agencies and the railroads to work out faster movements for the cars.

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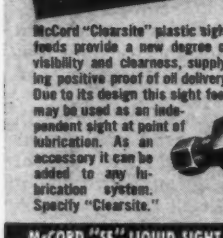

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DETROIT 11, MICHIGAN
LUBRICATOR DIVISION

REFINING

Collyer Urges Disposal of Synthetic Rubber Plants

RECOMMENDATIONS that serious consideration be given to returning crude rubber to a free-market basis at the end of this year and that the Government sell or lease to private industry its facilities for producing American-made synthetic as soon as the world shortage in rubber supply is eased, have been made by John L. Collyer, president of B. F. Goodrich Co.

Collyer's appraisal of the outlook for crude and American-made rubber was the ninth in a series of rubber studies the company has issued since 1940. Establishment of free market conditions, his analysis pointed out, would be the first step toward achieving economic benefits foreseen as chief byproducts of the coming competition between crude and American-made rubber. He listed these benefits as lower-cost products, wider use of rubber in new applications, broadened markets, and increased employment possibilities.

The study shows general-purpose rubber can be manufactured and sold by private industry at a 600,000-tons yearly rate for between 15 and 17 cents a pound. The current delivered cost of Far East crude rubber is between 25 and 26 cents a pound.

"For the present, of course," the report said, "world-wide demand for rubber is such that it is impossible to get a true picture of how preference for crude rubber will stand up with the indicated differential of 8 or more cents a pound." However, it said that some time in 1947 the available supplies will be such as to allow manufacturers a free choice of one or the other—or both in varying combinations.

In urging that the Government proceed with the program, recommended by the Inter-Agency Committee on Rubber, of selling or leasing to industry the rubber-producing facilities, Collyer asserted the matter of military security must be the foremost consideration. He again proposed maintenance, "in plants kept in condition and ready to run," of 600,000 tons standby capacity, and minimum actual production and use of 200,000 tons a year from those plants.

Discussing technical progress, the study said that "as of now, and taking the realm of large-tonnage uses as a whole, crude rubber still has the advantage in performance." It added, however, that great progress has been made since the early months of this country's experience in using American-made rubber, in (1) the rubber itself, notably in making improved variations of the main-type rubber formula; (2) compounding; (3) product construction, through greater use of rayon and other man-made filaments; and (4) in designing products.

Hydrocol Production Set at 5,800 Bbl. Motor Fuel Daily

McALLEN, Tex.—Carthage Hydrocol, Inc., will produce 5,800 bbl. per day of motor fuel from 64,000,000 cu. ft. of natural gas, according to an announcement made here recently.

In addition, the plant will make 1,200 bbl. of high-cetane-number diesel fuel along with some 500 bbl. of crude alcohols as a byproduct of the Fischer-Tropsch reaction employed

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in the process. The $19,000,000 plant will be built near Brownsville and will draw gas from La Gloria, South Weslaco, La Blanca, and South Mercedes fields in Hidalgo County. This county is said to have 5 trillion cubic feet of natural-gas reserves.

Socony-Vacuum Paulsboro Plant Marks Anniversary

PAULSBORO, N. J. — Old-timers, who witnessed the firing of the first crude-oil still here in 1916, were honor guests at last week's thirtieth-anniversary celebration by the Paulsboro refinery of the Socony-Vacuum Oil Co., Inc.

Highlight of the program was an informal luncheon in the refinery commissary at which Howard W. Sheldon, manager, welcomed the guests and L. W. Van Leuven, first refinery manager, responded. Among the honor guests were 42 employes who have been employed by the company for more than 30 years.

From an original 14 buildings, a staff of 300, with a monthly payroll of $57,000, the refinery has grown to a plant of 243 buildings, a staff of 2,377, and a payroll of more than $625,000 per month. In 30 years, the refinery has processed more than 155,000,000 bbl. of crude oil into automotive and aviation gasolines; fuel oils, including jet propulsion fuels; lubricating oils; greases; waxes; solvents; liquefied petroleum gases; and specialty products. Among innovations adopted at Paulsboro were the first commercial duo-sol plant, the thermofor catalytic-cracking pilot plant, the magic-bead catalyst, the two-stage atmospheric and vacuum distilling unit and the Houdry catalytic-cracking process.

Gulf Coast Stocks Follow General National Pattern

HOUSTON.—The stock position of member-company refineries of the Gulf Coast Refiners Association generally conformed to the national pattern during the first half of September with dropping motor-fuel and rising burning-oil inventories.

The association's report showed runs to stills at 102,849 bbl. daily during the period declined to 65 per cent of the rated 158,000-bbl. daily operating capacity. The plants reported operations at 72 per cent of capacity during the last half of August.

Stocks of all grades of gasoline and naphthas decreased during the first half of September by 240,492 bbl. and were reported at 1,516,392 bbl. A year ago, total gasoline stocks were 1,565,388 bbl. Automobile gasoline stocks considered alone were 1,005,986 bbl. September 15, showing a decrease of 244,069 bbl.

One exception to the general trend was kerosene, stocks of which were 252,659 bbl. September 15, a decrease of 41,301 bbl. Diesel gas-oil stocks September 15 were 146,802 bbl., reflecting an increase of 22,920 bbl. Stocks of No. 5 fuel oil increased 39,544 bbl. to 484,607 bbl., and Bunker C fuel oil increased 146,413 bbl. to 567,010 bbl. September 15. Total stocks were reported at 4,670,946 bbl. September 15, up 285,058 bbl., and compared to a total a year ago of 3,732,371 bbl.

A.S.T.M. Symposium Set

PHILADELPHIA. — A symposium sponsored by Subcommittee IV on Liquid Insulation of the American Society for Testing Materials' Technical Committee D-9 will be held October 16 at Chalfonte-Haddon Hall, Atlantic City, N. J. Primary purpose of the symposium is to analyze and evaluate some of the current tests and procedures used to give indications of the serviceability of an oil, an A.S.T.M. announcement said.

Oil-Canning Station Planned

CHATHAM, Ont. — Speedway Petroleums, Ltd., affiliated with Speedway Rubber Corp. of New Haven and Norwalk, Conn., and Speedway Petroleums, Inc., of Detroit, will erect an oil-canning and distributing station here this fall.

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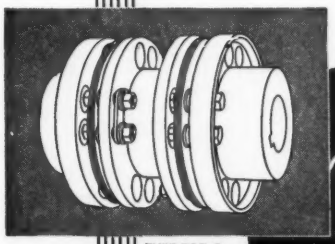

THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float . . . and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!

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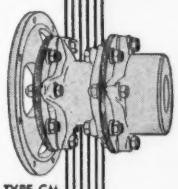

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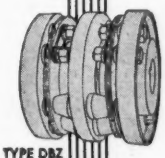

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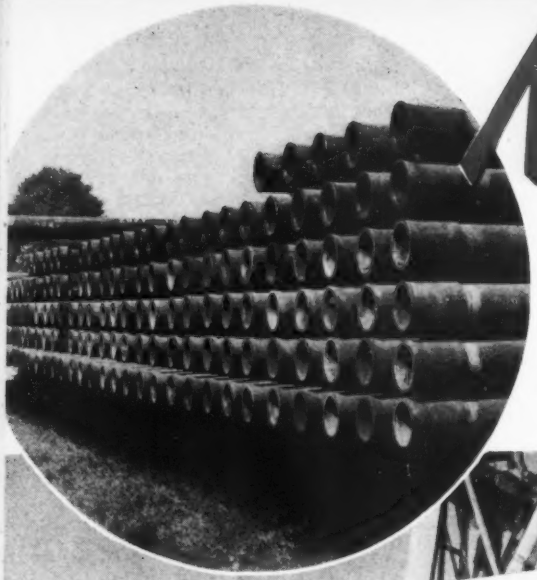

PRECISION in pipe threads is extremely important, and National Tube engineers have been responsible for many improvements in thread cutting equipment which have resulted in a threaded connection for Oil Country goods unsurpassed for strength and tightness under the highest gas pressures encountered.

DEEP TEST of the Oklahoma Natural Gas Company at Oakwood No. 1 Unit Well, a Dewey County wildcat, drilled by Olson Drilling Company. Every joint in the entire 8434 feet was uniformly tight. The string was run in the following order.

Casing shoe	1'9"
Float collars	3'2"
51 joints - 47#	2022'
31 " - 43.5#	1330'3"
80 " - 40#	3261'7"
16 " - 43.5#	687'3"
31 " - 47#	1138'2"
Total Footage	8434'2"

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NATIONAL TUBE COMPANY — USS STEEL — UNITED STATES STEEL

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It's National Seamless 100%

RECENTLY an 8,434 foot string of NATIONAL Seamless 9-⅝" OD Casing was run in a deep-test well in Dewey County, Oklahoma. Field engineers of National Tube Company were invited to witness the event.

One after another, the sections of casing were quickly spun in. Minimum power make-up buried the threads in every instance except one, where a single thread was left exposed; after another wrap on the cathead, indications showed tight make-up on this joint.

This job is cited not as any kind of a record, but because it represents a good average experience with NATIONAL Seamless Casing which you can expect day after day, string after string. No records were involved, no special selection of casing was made, but each joint went together smoothly, without trouble.

When eight thousand feet of casing make up like this, it indicates the consistent quality of the steel and high degree of accuracy with which the threads are cut. That's why you get faster stabbing, faster running time, and greater assurance of leakproof joints when you use NATIONAL Seamless.

NATIONAL Seamless Casing, Drill Pipe, and Tubing are pierced from solid billets of finest quality steel. There is no longitudinal weld—no line of potential weakness. Each tube is a perfectly formed cylinder, with uniform wall strength throughout. When you use NATIONAL Seamless 100% you can be sure there are no "weak sisters" in the string.

A STAB, a spin, a few hits with the tongs and you have another tight joint with National Seamless Casing.

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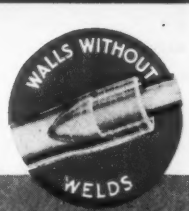

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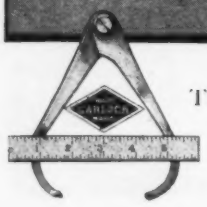

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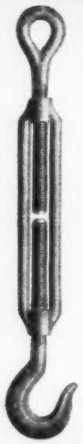

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• Norris Brothers Turnbuckles are made perfectly true by a special straightening process. Ends are tapped in line, assuring true concentric pull. And as for toughness, we've turned them inside out and twisted them into a pigtail braid without a sign of fracture. Made in sizes and types to fit most needs. Ask your supplier, or write for circular.

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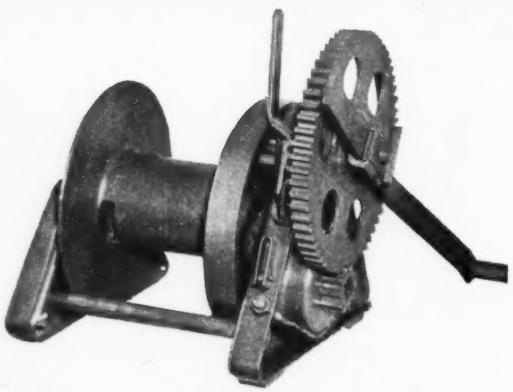

5 TONS CAPACITY with 70 lbs. crank load . . . weight 95 lbs. . . . 16½" by 15½" by 16¾" high . . . tops for small winch handiness, usefulness and value! All-steel tail yoke weighs 5 lbs., costs $4.00 extra. Prices are F. O. B. your dealer. Write for further information. American Hoist & Derrick Co., St. Paul 1, Minnesota.

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HANDIWINCH

PIPE LINES

Smith to Get Medal for Portable Pipe-Line Work

For his work in developing the portable military pipe line, Sydney S. Smith, manager of the products pipe-line department of Shell Oil Co., Inc., will be presented the Medal for Merit in a ceremony October 7 in Tulsa.

The award, highest given for citizen service during the war, was made by President Truman. Smith is given chief credit for the invention, design, and construction of the portable lines which delivered thousands of barrels of fuel daily to front-line units.

The Legion of Merit will be presented by Col. C. H. Chorpening, in charge of the U. S. District Engineers Office in Tulsa, at a dinner sponsored by M. F. Walters, D. E. Buchanan, John H. Boyle, E. A. Hanlon, and others. Smith, whose headquarters now are in New York, was formerly located in Tulsa with Shell. He is a former president of Natural Gasoline Manufacturers Association.

Sinclair Plans for Texas Line Revealed

Work on the construction of a product pipe line from Corpus Christi terminating at San Antonio and Austin, Tex., will be started by the Sinclair Refining Co. as soon as pipe is available, according to official information.

The 250-mile line will be 6-in. and will be supplied by Sinclair's 27,000-bbl. refinery at Corpus Christi. The line will be extended to Luling via Victoria and a terminal and storage facilities will be built at Luling. The line will extend to San Antonio and Austin from the Luling terminal. The Sinclair company has been active in new product pipe-line construction this year, having completed facilities from its East Chicago refinery to Toledo and Columbus, Ohio, and to Detroit.

Humble's New Line to Be Opened October 15

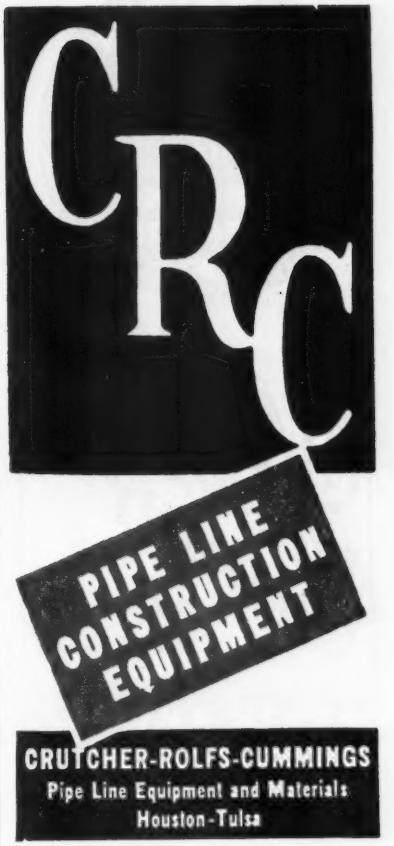
HOUSTON. — Humble Pipe Line Co.'s new 8-in. finished-products line will be formally opened October 15 to connect Humble Oil & Refining Co.'s Baytown, Tex., refinery with the heavy consuming areas of North Texas.

Beginning 276 pipe-line miles away on the Texas coast, the new artery ends at Irving, between Fort Worth and Dallas. Storage and terminal facilities have been provided for 150,000 bbl. of products, and delivery has commenced from the North Texas terminal by rail and transport trucks to sales outlets over a broad territory.

Thus, by employing pipe-line transportation, it has been made possible to bring to the interior of Texas gasoline produced by catalytic cracking and other refining processes of Humble's coastal plant. The Baytown refinery is currently running about 200,000 bbl. daily.

Humble Pipe Line Co. began construction of the line as soon after the war as material for the project became available.

The products line has a capacity of 15,000 bbl. daily: total cost was about $4,000,000. It was coated and wrapped by the latest type double-wrap machine, which automatically spiraled



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PIPELINE "Know-how"

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FORT WORTH 2, TEXAS

on a layer of thin Fiberglas under the conventional wrap of asbestos felt. To guard against corrosion, electrical connections for the cathodic protection process were installed at half-mile intervals.

Pump stations are at Baytown and Hearne, with delivery terminals at Houston, Hearne, Waco, and the Fort Worth-Dallas plant. Pumps are the multiphase, electrically driven, centrifugal type.

In the near future, the line's deliveries also will provide aviation gasolines for fliers and motor fuels for many of this area's industries and farms.

Warren Petroleum Lays Lines in Holliday Area

Warren Petroleum Co. has recently completed laying 50 miles of 2 to 22-in. gathering lines for the new gasoline plant in the Holliday, Tex., area.

The company is laying 50 to 60 miles of additional lines of the same sizes in the same area for gathering and repressuring to serve the East Holliday, Daume, and Hull-Silk pools. Both programs have been contracted by Holland Construction Co. Work is directed by G. G. Griffith, general superintendent.

The Holland company is engaged in reconditioning pipe for Shell Pipe Line Corp. near Cushing, Okla., and will start soon on other sections to be reconditioned on the Shell system near Seymour and Rankin, Tex.

Transit & Storage Co. Lays Products-Line Loops

Transit & Storage Co. is taking up 100 miles of 8-in. in Indiana, most of which is to be immediately relaid in four loops of 20 miles each in Ohio and Michigan. Most of the looping will be in Michigan.

The contractor, Williams Brothers Corp., has already started the work of taking up pipe and has established headquarters at Laketon, Ind. J. C. Virgin, superintendent, is in charge of the take-up, and J. A. Owens is office manager. The contractor plans to have two gangs taking up pipe and two or three gangs laying pipe with the objective of completing the project about December 1.

Some men for this project will be moved from East Ohio Gas Co. construction which is nearly completed with only a few miles to lay. This job has been done by three gangs under H. L. Davis, superintendent, laying a total of 138 miles of 18 and 20 in. From the East Ohio project part of the men and equipment have been moved to lay 54 miles of 20 in. for Manufacturers Light & Heat Co. which is half completed. This project is handled by three gangs under G. A. Manuel.

Williams Brothers is starting the laying of 6 in. for Great Lakes Pipe Line Co. between Albert Lea and Mankato, Minn. The crew is supervised by Leman Creech, with headquarters at Wells, Minn.

New 6-In. Line Planned

Stanolind Pipe Line Co. is reported planning replacement of its present 4-in. line leading into the Cotton County area of southwestern Oklahoma, with a new 6-in. carrier. The area is undergoing active development.

CORROSION PREVENTION

• These protective materials for all types of structures, above and below ground, have been proved by years of service to effectively prevent corrosion under most severe conditions. Order them for your next job.

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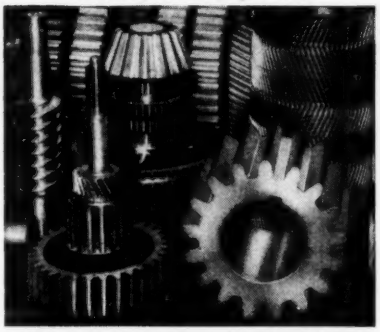
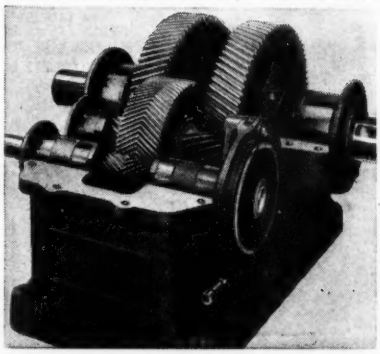
GEARS—for every need



Three conveniently located Pacific-Western plants are equipped to turn out a wide range of gears—continuous tooth herringbone gears, hob cut herringbone gears, helical, spur, spiral, worm, hypoid and zerol bevel gears.

PACIFIC-WESTERN SPEED REDUCERS



Pacific-Western Speed Reducers are available for ratios of 2:1 to 300:1; for transmitting from fractional horsepower to 1,500 hp., in standard units. Larger special units available upon request. Full range of sizes are available in single, double and triple reductions with single or multiple power takeoffs.

Look to PACIFIC-WESTERN for "PRECISIONEERED" Gearing

Scores of Western industries look to Pacific-Western for the design and manufacture of gears, speed reducers and for mechanical power transmissions within their products.

The designing of this geared equipment calls for a wealth of engineering knowledge in all fields of industry: Aviation, Marine, Mining, Petroleum, Lumber, Paper, and others.

This designing talent and creative "know-how" of our engineers has been a major part of our service for over 50 years—is available today at our three West Coast plants to help you develop your own ideas of efficient mechanical power transmission.

Phone or write our nearest plant or office for engineering counsel.

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Plants and Offices: SEATTLE, SAN FRANCISCO, LOS ANGELES, LYNWOOD
Sales Representatives: Portland, Salt Lake, New York

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 28, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	31	15	0	*16	42,032	1,175	1,083	0	0	0	0	0	0	0	0	0	0
Pennsylvania	80	40	6	†34	122,876	2,958	3,067	0	0	0	0	0	0	0	0	0	0
West Virginia	22	2	18	2	49,956	555	601	0	0	0	0	0	0	0	0	0	0
Ohio	27	9	12	6	69,929	914	700	0	0	0	1	1	2	0	12	28	42
Indiana	18	11	0	7	42,096	276	148	0	0	0	1	1	3	0	0	14	17
Kentcky	10	2	5	3	21,796	352	389	0	0	0	0	0	5	0	0	31	36
Illinois	47	21	0	26	120,830	1,589	1,329	0	0	0	11	11	36	0	1	330	367
Michigan	20	5	1	14	41,621	609	557	1	0	0	9	10	19	0	6	198	223
Kansas	45	15	18	12	138,691	1,472	1,280	0	0	0	9	9	23	0	1	195	219
Neb., Mo., Iowa	0	0	0	0	0	15	18	0	0	0	0	0	0	0	0	11	11
Oklahoma	77	47	5	‡25	228,093	2,039	1,812	2	0	0	10	12	64	0	29	250	343
Texas	157	95	12	50	672,365	5,912	5,348	5	0	2	22	29	163	23	26	971	1,183
North Central	57	27	2	§28	148,948	2,123	1,639	2	0	0	11	13	51	0	4	402	457
West	39	34	1	4	176,961	1,280	1,334	2	0	0	1	3	41	0	1	134	176
Panhandle	8	5	2	1	24,458	243	417	0	0	0	0	0	0	0	0	5	5
Eastern	12	7	1	4	55,780	539	250	0	0	0	3	3	15	0	2	72	89
Gulf Coast	31	17	6	8	220,277	1,291	1,217	1	0	2	5	8	38	21	10	189	258
Southwest	10	5	0	5	45,941	436	491	0	0	0	2	2	18	2	9	169	198
Louisiana	26	15	2	9	153,870	1,006	782	0	1	0	4	5	41	9	7	139	196
Northern	15	9	1	5	44,235	566	315	0	0	0	1	1	8	0	2	78	88
Southern	11	6	1	4	109,635	440	467	0	1	0	3	4	33	9	5	61	108
Arkansas	4	1	0	3	17,336	135	132	0	0	0	1	1	6	0	0	30	36
Mississippi	6	3	0	3	33,351	182	274	0	0	0	2	2	1	0	1	51	53
Southeastern States	2	1	0	1	17,537	33	45	0	0	0	1	1	1	0	0	27	28
Montana	8	4	4	0	15,016	232	237	1	0	0	0	1	10	0	1	24	35
Wyoming	4	3	1	0	15,118	130	159	0	0	0	0	0	11	0	3	30	44
Colorado-Utah	6	6	0	0	38,238	114	37	0	0	0	0	0	4	0	0	12	16
New Mexico	15	10	2	3	63,533	289	311	0	0	0	2	2	3	0	0	30	33
California	18	11	2	5	70,838	1,208	1,714	0	0	0	4	4	18	0	4	163	185
Total United States	623	316	88	219	1,975,122	21,295	20.023	9	1	2	77	89	410	32	91	2,534	3,067
Total previous week	583	300	66	217	1,806,371	20,672	19,440	16	2	3	82	103	401	31	89	2,457	2,978
Total Sept. 29, 1945	583	323	58	202	1,963,161			15	0	1	72	88	392	18	108	2,547	3,065

Service wells included: *16, †31, ‡1, §2.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	....
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9	....	1.42	1.65	1.29
32-32.9	....	1.44	1.67	1.31
33-33.9	....	1.46	1.69	1.33
34-34.9	....	1.48	1.71	1.35
35-35.9	....	1.50	1.73	1.37
36-36.9	....	1.52	1.75	1.39
37-37.9	....	1.54	1.77	1.41
38-38.9	....	1.56	1.79	1.43
39-39.9	....	1.58	1.81	1.45
40 and above	....	1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.500-7.750	6.875-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	8.750-9.500	7.750-8.500
California		7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F. R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.5-4.75	5.4-5.7
N. Texas (f.o.b. plant)	4.000	4.800
N. Louisiana (f.o.b. plant)	4.250	5.100
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.41
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended September 21, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Distillate	Stocks: Residual
East Coast	763	21,212	20,989	11,756
Appalachian	144	2,968	700	519
Ill., Ind., Ky.	769	15.445	8.402	5,270
Okla., Kan., Mo.	368	8.170	3.555	1,394
Inland Tex.	213	2,676	599	693
Tex. Gulf Cst.	1,222	12,667	8.517	7,330
La. Gulf Cst.	367	4,404	3,029	1,830
N. La., Ark.	60	1,624	432	234
Rocky Mt.	145	1,451	600	817
California	734	15,237	11,083	27,071
Total 9-21-46	4,785	85,854	57,906	56,914
Total 9-14-46	4,892	85.818	56,204	55,736
Total 9-22-45	4,448	80,342	44,963	48,117

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
September 21, 1946	222,664,000
September 14, 1946	221,903,000
September 22, 1945	215,417,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Sept. 28 crude oil	B. of M. Sept. demand	Sept. 21 crude oil
Alabama	1,000	1,200	1,050
Arkansas	78,200	78,000	78,100
California	875,600	855,000	867,500
Colorado	36,510	31,000	35,580
Eastern	68,000	65,000	67,500
Florida	100	200	100
Illinois	209,000	214,000	202,900
Indiana	18,300	19,000	19,400
Kansas	276,000	264,000	277,800
Kentucky	31,000	31,000	31,100
Louisiana	398,900	384,000	398,300
North Louisiana	94,900	.....	94,300
South Louisiana	304,000	.....	304,000
Michigan	47,270	47,000	45,949
Mississippi	73,200	61,000	74,750
Montana	24,620	24,000	24,720
Nebraska	700	800	700
New Mexico	99,400	100,000	99,400
Oklahoma	354,850	386,000	353,550
Texas	2,088,400	2,120,000	2,088,400
District 1 (Southwest)	19,400	.....	19,400
District 2 (Southwest)	148,400	.....	148,400
District 4 (Southwest)	220,000	.....	220,000
District 3 (Gulf Coast)	464,850	.....	464,850
District 5 (Eastern)	41,000	.....	41,000
District 6 (Eastern)	103,500	.....	103,500
East Texas field	326,000	.....	326,000
District 7C (West)	27,200	.....	27,200
District 8 (West)	491,200	.....	491,200
District 7B (W. Central)	32,850	.....	32,850
District 9 (N. Central)	129,000	.....	129,000
District 10 (Panhandle)	85,000	.....	85,000
Wyoming	109,630	108,000	108,470
Miscellaneous other	.....	800	.....
Total United States	*4,790,680	4,790,000	4,775,269
Change from prev. week	up 15,411		

Total production January 1-September 28 ..... †1,285,571,550 bbl.
Same period last year (crude, plus condensate) 1,299,942,475 bbl.
*Not incl. 22,200 bbl. condensate. †Incl. 6,574,000 bbl. condensate.

CRUDE-OIL STOCKS 222,664,000 bbl. as of September 21—up 761,000 bbl. One year ago 215,417,000 bbl.

GASOLINE STOCKS 85,854,000 bbl. as of September 21—down 964,000 bbl. One year ago 80,342,000 bbl.

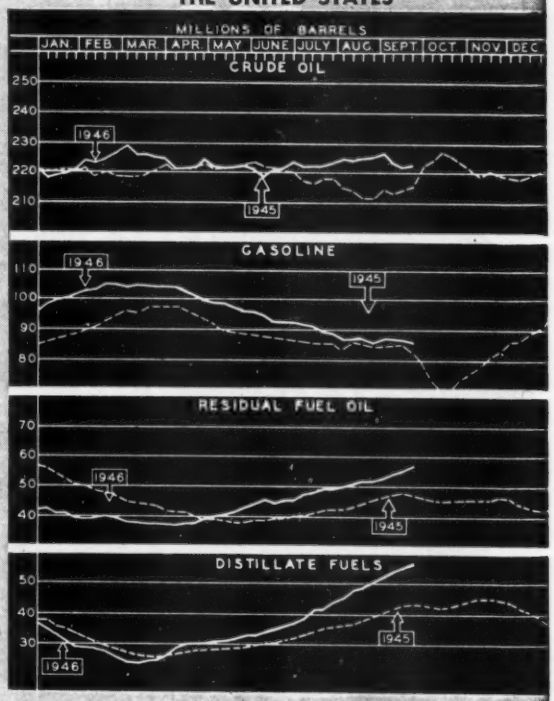
RESIDUAL FUEL-OIL STOCKS 56,914,000 bbl. as of September 21—up 1,178,000 bbl. One year ago 48,117,000 bbl.

GAS OIL AND DISTILLATE STOCKS 57,906,000 bbl. as of September 21—up 1,702,000 bbl. One year ago 44,963,000 bbl.

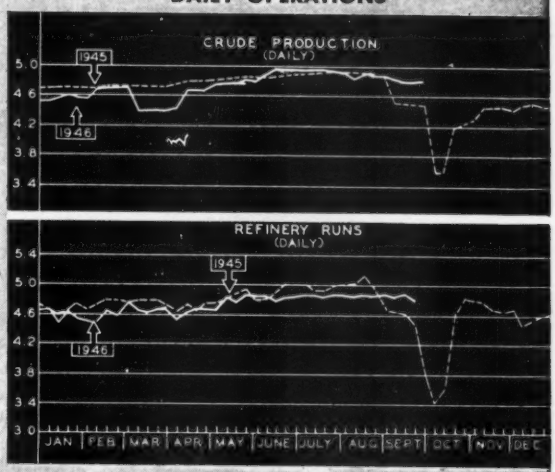
CRUDE-OIL PRODUCTION 4,790,680 bbl. as of September 28—up 15,411 bbl. One year ago 4,481,150 bbl.

REFINERY RUNS 4,785,000 bbl. daily week ended September 21—down 107,000 bbl. One year ago 4,448,000 bbl.

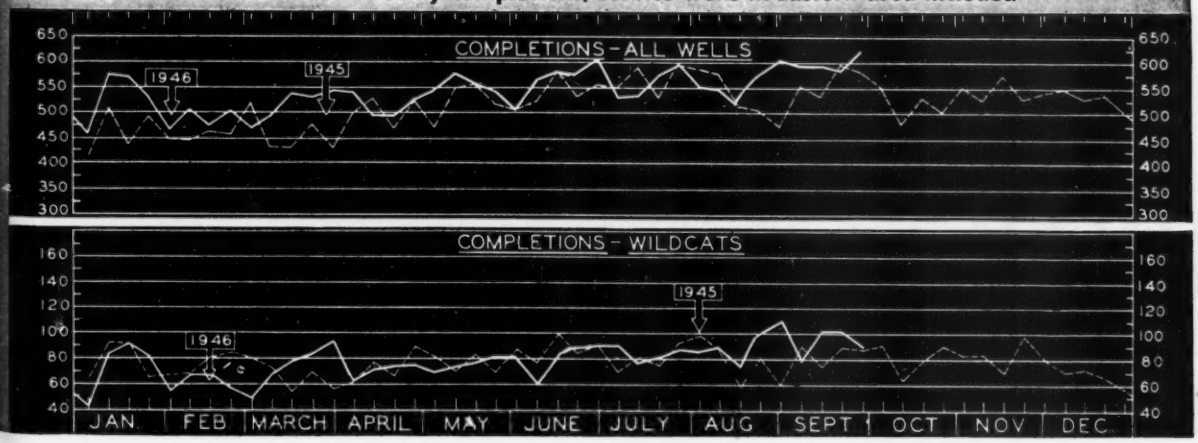
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



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SECOND: Tools and equipment which meet every demand of dependable performance.

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Our Rental Equipment includes:

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Drill Collars: 3¼" O.D. to 6¼"
Cameron Blowout Preventers: 10,000 lb. and 6,000 lb. test Q. R. C., 7" and 10¾", 3" 3¼", 4¼"
Kelly Joints: Sizes 2½", 3", 3¼", 4¼"
Rotary Tongs: New Style, Sizes 2⅜" to 5¼"
Rotary Slips: 2⅜", 2⅞" and 3½"
Elevators: 2⅜", 2⅞" and 3½"
Hughes Type "J" Core Barrels
Safety Joints: 2⅜", 3½" and 4½"

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Exploration and Drilling

New Pay for Elk Basin, Wyoming

DRILL-STEM tests indicating potential production in the Madison lime, in the Elk Basin field, on the Wyoming-Montana border, in the Big Horn Basin, may add substantial reserves to that field. The field which is unitized, and about drilled up in the Tensleep sand, may see another drilling campaign if the current test develops as favorably as it now looks.

The well, Elk Basin Unit 38-M, NE SE NE 24-58n-100w, operated by Stanolind Oil & Gas Co., for the unit, is an old Tensleep producer drilled deeper. Originally completed as Continental Oil Co. 101 E. T. Elk 2, in September 1943, in Tensleep topped at 3,939 ft., total depth 4,136 ft., the well was chosen as a test to be deepened, probably because it is on the top of the structure.

Top of the Madison lime (Mississippian) was found at 4,350 ft., and the well has penetrated about 275 ft.. of an estimated 600-ft. thickness of Madison thus far. In that interval four drill-stem tests have been made to date. At 4,402-25 ft. the result was gas in 29 minutes, and after a total of 60 minutes, recovery of 180 ft. of oil and 30 ft. of oil-cut mud. Oil tested 18° gravity. At 4,473-501 ft., another 60-minute test resulted in gas in 8 minutes and recovery of 2,160 ft. of oil and oil-cut mud, gravity checking 29.8°. A third test at 4,569-600 ft., time not given, resulted in recovery of 1,600 ft. of oil. The fourth test at 4,569-610 ft., open 90 minutes, resulted in recovery of 2,400 ft. of oil, bottom-hole shutin pressure 1,630 psi., flowing pressure 560 psi.

Coring record shows that at 4,493-501 ft., only 2 ft. were recovered of the 8-ft. interval; from 4,600-10 ft., only 3½ ft. were recovered; from 4,610-20 ft., only 1 ft. was recovered. The recovered core in the first interval was hard dense dolomite; in the second it was crystalline dolomite with porosity and saturation; in the third, crystalline dolomite, only slightly porous.

With an estimated 325 ft. of Madison section remaining, the well will probably be drilled cautiously, possibly stopping to core at intervals, until the water level is established. If appearances are promising, further drill-stem tests will be made. With the field unitized, every incentive is to get the maximum amount of information about the Madison reservoir out of the first well, so that the best plans for future development can be formulated in advance.

Some Madison production has been found at Frannie and at Oregon Basin fields, both of which are also geologically in the Big Horn Basin, along with the latest discovery. However, the gravity has been around 18° in these other fields. The 29.8° test at Elk Basin compares favorably with other black oil in this region.

EASTERN TEXAS

Nacogdoches Wildcat Is Contracted to 5,550 Ft.

DALLAS.—Delta Drilling Co. et al 1 Houston, A. L. Martin Survey, wildcat ¾ mile northeast of Martin's Mill, Van Zandt County, is dry at 9,210 ft. after entering the Travis Peak at 9,003 ft. Elevation is 477 ft. Humble Oil & Refining Co. 2 Pickering Lumber Co., W. D. Woodfin Survey, in the Huxley area of Shelby County, is dry at 7,502 ft. The test showed salt water in drilling to total depth. It was plugged back to the Upper Pettit and tested salt water again at 3,250-60 and 3,300-35 ft. with only slight shows of oil and gas.

Dunagan Brothers & Watt 1 Arkan Cranford is a new wildcat just south of Sacul in Nacogdoches County. It is 7,055 ft. from the north and east lines of the Jose Maria Musques Survey. It is contracted to 5,500 ft., or to the Woodbine sand. Atlas Oil & Refining Co. will drill a wildcat 7 miles southeast of Naples in northwestern Cass County. It is on a 71.45-acre tract in the W. G. Anderson Survey. It is scheduled to go to 5,500 ft., which probably will take it to the Paluxy.

Opelika field, Henderson County, Hawkins and Manziel fields, Wood County, each had one completion. Carthage field, Panola County, has six locations, Smithland field, Marion County, had four, and Waskom field, Harrison County, three. Carthage field has 33 drilling wells, Hawkins field 8, Opelika field 5, and Talco field, Titus and Franklin counties, Sand Flat field, Smith County, Henderson field, Rusk County, and Waskom field each had 4.

EASTERN TEXAS WILDCAT FAILURES

Bowie County: Delta Drlg. 1-A J. M. Gauntt, James Giles Sur., 10 mi. E Dalby Springs, elev. 324 ft., Goodland 3,873 ft., Paluxy 3,929 ft., dry, TD 4,180 ft.

Navarro County: A. E. Stewart et al 1 R. L. Hodge, Alfred Eaton Sur., 1 mi. N Chatfield, Paluxy 3,667 ft., dry, TD 3,808 ft.

R. L. and T. N. Wheelock and Temple Hargrove 1 E. V. Smith, Joseph Bragg Sur. A-104, 4 mi. SE Corsicana, elev. 395 ft., Woodbine 2,977 ft., dry, TD 3,476 ft.

APPALACHIAN FIELD

Record Gas Volume in Chestnut Ridge Test

PITTSBURGH. — On Chestnut Ridge in Georges Township, Fayette County, southwest Pennsylvania, a record volume of gas was struck in the wildcat by New Penn Development Co., Wm. E. Snee et al on the J. R. Smith farm, 6,600 ft. south of existing production on the Barton tract. At 7,063 ft., 1 ft. in the Onondaga chert, a gage of 500,000 cu. ft. gas was struck with pilot tools and the pressure back of it blew the tools up the hole and jammed with the cable. During fishing operations with the spear hung onto the cable of the lost tools, the gas volume increased to 2,500,000 cu. ft. and then later to 10,000,000 cu. ft. with signs of increasing. Work was suspended. The gage later increased to better than 40,000,000 cu. ft. gas and is still producing at that rate after having blown open during the night. A pall of cement, shale dust, and cuttings hangs over the blowing well which can be heard for miles. Rocks are blown out of the hole.

A special crew was to attempt to cement in the surface string of 9¾-in. casing and anchor it. As the standard bit had not been used after piloting, the hole stands open below the surface string of 900 ft. of casing. The fishing tools are hung up on the old cable in the hole so that it presents a difficult job for control.

In Walton district, Roane County, West Virginia, Johns Gas Co. topped the Corniferous lime at 5,295 ft. in the deep wildcat on Isaac L. Summers farm which from a surface elevation of 855 ft. places it —4,440 ft. The Big lime was topped at 1,756 ft., Injun sand 1,904-53 ft., Berea 2,361-68 ft., and casing run to 5,328 ft. Based on the Berea, it appears regionally high. On the Walton Quad, it is located 0.15 mile south latitude 38° 35′; 1.2 mile west longitude 8° 25′. It is miles from lower Devonian gas.

In Ripley district, Jackson County, United Fuel Gas Co. completed 5,771 F. F. Starcher in the Oriskany sand with a final open flow, natural, of 11,698,000 cu. ft. gas with the surface elevation 739 ft., Corniferous lime 4,821 ft., Oriskany 4,930-55 ft., gas 4,925-55 ft., rock pressure 1,250 lb. in 48 hours, total depth 4,955 ft.

In Ravenswood district, Jackson County, Spartan Gas Co. completed 1-S81 Basil Pursley with a gage of 6,936,000 cu. ft. gas, natural; surface elevation 837 ft., Corniferous lime 4,904 ft., Oriskany 5,008 ft., gas 5,008-30 ft., rock pressure 1,100 lb. 24 hours, total depth 5,030 ft.

United Carbon Co. topped the Corniferous lime at 4,935 ft. in the 1,398 Ermina Puckett test, Ripley district, which from a surface elevation of 875 ft. places it —4,060 ft. This company is drilling through the Cor-

niferous lime at 4,670 ft. in the test 1,397 T. A. Wilcox, which from a surface elevation of 596 ft. places it —4,074 ft.

In Jefferson district, Nicholas County, Thompson Gas Co. completed a second test, T-78 Lewis Land & Coal Co., in the Big lime topped at 2,233 ft. with 5,097,000 cu. ft. gas, natural, at 2,382-90 ft., rock pressure 311 lb. in 12 hours, total depth 2,390 ft.

In Wyoming County, Baileysville district, Hope Natural Gas Co. completed 9.004 New River, and Pocahontas Consolidated Coal Co. as a large Berea well gaging 6,328,000 cu. ft. gas, natural, with the Berea 3,797 ft., gas 3,805-26 ft., rock pressure 800 lb. 24 hours, total depth 3,826 ft.

Here, United Producing Co. completed 1,356 W. M. Ritter Lumber Co. good for 1,885,000 cu. ft. gas, after shot, with the Berea 3,804-35 ft., rock pressure 790 lb., total depth 3,836 ft.

PERMIAN BASIN

Shell's Glasscock County Well Testing Mississippian

MIDLAND.—Shell Oil Co., Inc., 1 L. C. and L. T. Clark, Section 5, Block 32, T-4-N, T&P Survey, wildcat 7 miles northeast of Garden City, Glasscock County, flowed 43 bbl. of fluid in 24 hours through open 2-in. tubing, 90 per cent oil and 10 per cent salt water. Operator is testing through 61 perforations in casing from 9,740-55 ft. It is reported to be testing in the Mississippian. Total depth is 10,970 ft.

Humble Oil & Refining Co. 2 H. O. Sims et al, Section 25, Block A-39, Public School Land Survey, western Andrews wildcat 3 miles northwest of the Nelson Ellenburger pool, ran a 110-minute drill-stem test from 7,488-7,669 ft. Recovery was 5 ft. of free oil and 205 ft. of drilling mud stained with oil. There was no water. The test was drilling ahead below 7,699 ft., headed for the Ellenburger. First oil show was on a 105-minute drill-stem test from 7,208-7,375 ft., when it recovered 240 ft. of oil-stained and gas-cut mud and 260 ft. of 37.7°-gravity oil, 12 per cent basic sediment.

Stanolind Oil & Gas Co. and Westbrook-Thompson Holding Corp. 35-A Hendrick, Section 33, Block 26, Public School Land Survey, deep test in shallow Hendrick pool in Winkler County, elevation of 2,864 ft., topped the Ellenburger at 13,385 ft. There was a slight show of oil from 13,700-20 ft. Operator will deepen to 13,800 ft., run 5½-in. casing to bottom and test this show. Stanolind 1 Moss, Section 8, Block B-2, Public School Land Survey, assured a ¼-mile north extension to the Keystone-Devonian sector of Winkler County. On a 1-hour drill-stem test from 7,991-8,051 ft. there was gas to the surface in 7 minutes, oil in 19 minutes, and in 41 minutes the well was flowing at an estimated rate of 480 bbl. of oil daily.

Warren Petroleum Corp. 1 Hamilton Est., Section 275, Block 1-A, H&TC Survey, wildcat 1 mile southeast of Blackwell, Coke County, is dry at 6,675 ft. in the Ellenburger. On a 1-hour drill-stem test from 6,530-675 ft. recovery was 400 ft. of drilling mud and 500 ft. of sulfur water. The test went into the Ellenburger at 6,367 ft., with elevation of 2,992 ft.

Mid-Continent Petroleum Corp. 8-11 University, Section 29, Block 31, University, opened a new pay in the Fullerton field of Andrews County. It was completed in the Holt zone through perforations from 6,070-131 ft., pumping 110 bbl. of 36°-gravity oil daily.

Fort Stockton field, Pecos County, had three completions this week and the TXL-Ellenburger field, Ector County, Fullerton field, Andrews County, Keystone-Colby and Keystone-Ellenburger fields, Winkler County, each had two. Fullerton field, TXL-Ellenburger field and Slaughter field, Hockley and Cochran counties, each had four locations, and Howard-Glasscock field, Howard County, had three. TXL field has 37 drilling wells; Fullerton field 28; Block 12 field, Andrews County, 20; Keystone-Ellenburger field, 18; Wheeler-Ellenburger field, Winkler and Ector counties, 9, and Keystone-Holt and Monahans North fields, Winkler County, each 7.

WEST TEXAS SUCCESSFUL WILDCATS

Ector County: Extension to old field—J. W. Murchison et al 1 Geo. C. Fraser, Sec. 7, Blk. 45, T-2-S, T&P Sur., 3¼ mi. S TXL field, elev. 3,070 ft., pumped 29 bbl. day through 2-in. tubing, perf. 8,510-63 ft. Devonian, gravity 40°, TD 8,566 ft.

Upton County: New oil pool—Gilcrease Oil Co. 1 University, Sec. 19, Blk. 14, University Ld., 12 mi. SW Rankin, elev. 2,384 ft., pumped 6 bbl. day, perf. 1,428-1,512 ft. Grayburg, gravity 32°, TD 1,535 ft.

WEST TEXAS WILDCAT FAILURE

Pecos County: Burk Royalty Co. 1 W. T. Shearer, Sec. 81, Blk. 10, H&GN Sur., 2 mi. NE Lehn field, elev. 2,416 ft., dry, TD 1,950 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Barnsdall Oil Co. 1 D. C. Hardy, 29-21s-37e, 1½ miles northwest of the Drinkard (Yeso) field in central eastern Lea County, flowed oil for 2 hours at a rate estimated at 16 bbl. hourly on a drill-stem test from 6,514-652 ft. in the Drinkard pay zone. Gas came to the surface in 9 minutes, mud in 47 minutes, and oil started flowing 50 minues after the tool was opened. There was no water. Later the well swabbed and kicked off to flow for 24 hours at the rate of 18 to 20 bbl. of oil per hour natural. With elevation of 3,474 ft., it topped the Glorietta at 5,120 ft., the Tubb at 6,065 ft., and the Drinkard pay at 6,514 ft. It is an old well drilled deeper. Operator was to take completion tests and put the well on production. Magnolia Petroleum Co. 9 E. O. Carson, Section 33-21s-37e, is a new producer for the field. It is a ¼-mile north outpost. It has been completed to flow 768 bbl. of 32.9°-gravity oil in 24 hours through open 2-in. tubing. Casing was perforated from 6,529-40, 6,551-87, and 6,594-601 ft.

Paddock field, Lea County, had three completions, and Fren field, Eddy County, had two. Paddock, Cooper-Jal, and South Eunice fields, Lea County, each had one location. Drinkard field, Lea County, has 16 drilling wells; Grayburg-Jackson field, Eddy County, 12; Paddock field, 9; Square Lakes field, Eddy County, 7; Brunson field, Lea County, 6, and Langlie-Mattix field, Lea County, 5.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURES

DeBaca County: Pure 1 Federal, 31-3n-28e, 13 mi. E Ft. Sumner, elev. 4,121 ft., Pennsylvanian 5,160 ft., dry, TD 6,469 ft.

Eddy County: E. Orcutt 2 F. E. Kepple, 19-17s-27e, 2 mi. NW Empire pool, dry, TD 1,375 ft.

MICHIGAN

Thirty Locations Reported In Michigan During Week

SAGINAW.—Listing 30 new locations in 11 counties, Michigan oil and gas operators reported 20 completions for the week, all but five of them dry holes. Production came from one gas well and four oil explorations, one of which was a Tuscola County wildcat of no apparent importance. Wildcat completions totaled 10. Six of the new locations are in Isabella County, four each in Bay and Newaygo, three each in Tuscola, Osceola and Van Buren, two each in Arenac and Clare, one each in Allegan, Kent and Montcalm.

MICHIGAN SUCCESSFUL WILDCAT

Tuscola County, Elkland Township: Gordon Oil Co. 1 Palm Book Land Co., SE SE SW 31-14n-11e, pumping 50 bbl. and salt water, acidized, TD 3,735 ft., PB 2,691 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: R. T. Jones 1 State-Heath, SE NE NW 33-3n-1w, dry in Traverse, TD 1,440 ft.

Casco Township: Charles W. Kendall 1 Paul Stephenson, SW NW SW 33-1n-16w, dry in Traverse limestone, TD 1,133 ft.

Allegan Township: Clyde B. Miller 1 Alexander Tarvid, SW NW NW 25-2n-13w, dry in Traverse, TD 1,497 ft.

Gratiot County, North Shade Township: McClure Drilling Co. 1 Mary Gager, SW SW SW 4-9n-4w, dry in Dundee, TD 3,209 ft.

Mecosta County, Austin Township: B. F. Austin Co., Inc., 1 State, NW NW SW 16-14n-9w, dry in Monroe, TD 3,851 ft.

Montcalm County, Day Township: McClure Drilling Co. 1 Dale Brand, NE SE SE 35-11n-6w, dry in Monroe, TD 3,413 ft.

Ferris Township: Montcalm Development Co. 1 Pollard et al, NW NW NE 8-11n-5w, dry, TD 1,222 ft.

Oceana County, Crystal Township: Charles W. Teater 1 J. F. Kenfield, NW NW SW 16-16n-16w, dry in Dundee, TD 2,365 ft.

Ottawa County, Jamestown Township: Clawson Development Co. 1 Hoeve & Van Koevering, C SE SE 30-5n-13w, dry in Traverse, TD 1,610 ft.

SOUTH LOUISIANA

New Gas Pool Opened in Lake Pontchartrain

NEW ORLEANS.—A new gas pool has been opened in Lake Pontchartrain, St. Tammany Parish, on State Lease 318, by Atlantic Refining Co. 1-A State. This area is known as the Big Point area. The well flowed an initial gage of 6,200,000 cu. ft. of dry gas in 24 hours through a ⅜-in. choke, and is now shut in. Total depth is 11,052 ft., and 9⅝-in. casing is cemented to 7,781 ft. for protection, and 5½-in. production string set to 9,370 ft. Production is through perforations at 7,180-88 ft.

Union Sulphur Co., Inc., has opened another new oil field in Calcasieu Parish. Its 1 Eugene Ellender et al, 17-11s-10w, off the south flank of the Choupique prospect, 5 miles north of production in the West Hackberry field, flowed an initial gage of 93 bbl. of 40°-gravity oil daily through a 14/64-in. choke with 3,100 lb. flowing pressure on the tubing and 300 lb. pressure on the casing. Gas ratio was 12,781 to 1. Production is through perforations at 8,825-31 ft.

A new sand for South Elton field, Jefferson Davis Parish, has been opened by Stanolind Oil & Gas Co. 3-A W. H. Tupper. Drilled to a total depth of 10,500 ft. in sidetracked hole, the well flowed 33 bbl. of condensate per day through a 12/64-in. choke, gas-oil ratio 16,573 to 1. Tubing pressure was 2,050 lb., casing pressure 2,100 lb., and gravity 50°. Production is through 60 perforations at 9,362-82 ft.

Of the 11 completions reported this week 6 are oil, 1 gas, and 4 dry. One new sand was opened in Jefferson Davis Parish, while three wildcats were dry, one each in Beauregard, Plaquemines and St. Charles parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Jefferson Davis Parish: New condensate sand South Elton pool: Stanolind Oil

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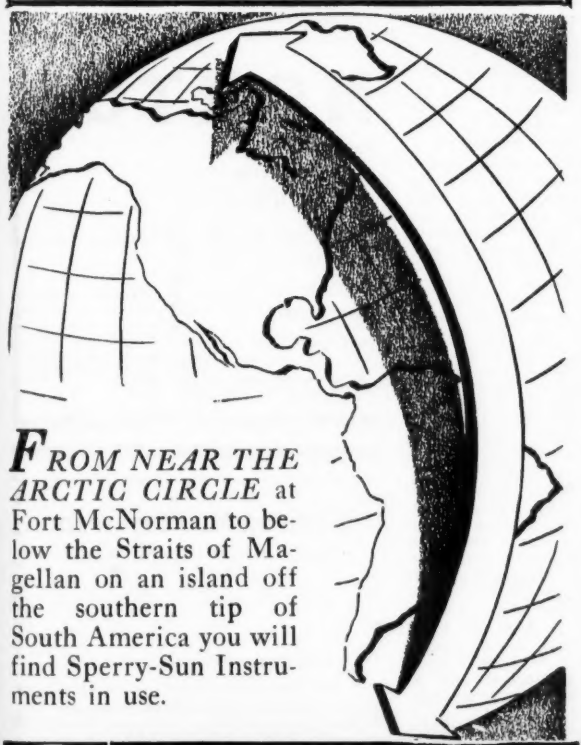

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& Gas Co. 3-A W. H. Tupper, 32-7s-3w, TD 10,500 ft. in sidetracked hole, perf. 9,362-82 ft., PT 33 bbl. condensate per day through 12/64-in. choke, gas-condensate ratio 16,573 to 1, TP 2,050 lb., CP 2,100 lb., gravity 50°, no water.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Barnsdall Oil Co. 1 Edgewood Land & Logging Co., 11-6s-10w, 2½ mi. N of Gordon field, dry, TD 12,827 ft.

Plaquemines Parish: Texas Co. 16 Delta Duck Club Unit, 5-21s-20e, dry, TD 10,233 ft.

St. Charles Parish: Atlantic Refg. Co. 1-D State-Lake Pontchartrain, in Lake-11s-9e, dry, TP 10,385 ft.

ROCKY MOUNTAIN

Prospects Improve for Elk Basin Madison Discovery

DENVER.—The Madison lime discovery in the Elk Basin field in Stanolind Oil & Gas Co. 38-M Unit, SE NE 24-58n-100w, Park County, Wyoming, continues to improve as drilling and coring proceeds into the pay. Top of the Madison was at 4,350 ft. A drill-stem test at 4,503-36 ft., open 1 hour, resulted in a recovery of 2,100 ft. of 29.8°-gravity oil through a ⅜-in. choke at the bottom and a 1-in. choke at the top. It built up a pressure of 1,675 lb. after being shut in for 20 minutes. The flowing pressure was 250 lb. It then cored to 4,610 ft. in saturated lime and attempted a drill-stem test, but the packer failed. A new zone of saturation was encountered at 4,565-4,610 ft., making a total of 110 ft. of well-saturated lime with some oil showing in the less porous zones. An additional 10 ft. then was cored to 4,620 ft., the cores showing crystals and dolomite with streaks of anhydrite. At a total depth of 4,623 ft. in dolomite, another drill-stem test was made at 4,569-4,610 ft., open 1½ hours, resulting in a recovery of 2,400 ft. of oil and no water through the ⅜-in. at the bottom and 1-in. choke at the top.

One other test to the Madison was drilled late in 1943 and early in 1944 in Stanolind's 1 Garth, NE NE NE 26-58n-100w. This well, which is 1¼ miles to the southwest of the discovery, had the top of the Madison at 6,607 ft. and encountered water. It also had water in the Tensleep. The Garth well had the top of the Madison at 2,196 ft. below sea level, while the discovery well topped the lime at 61 ft. above sea level. The Garth well was ½ mile west of the nearest Tensleep producer, which swabbed 10 bbl. per hour at a total depth of 5,387 ft.

Rangely outposts. — Idaho - Sharples-Wasatch 1-16 Larson, C NE SE 16-2n-103w, an outpost on the west side of the Rangely field, missed the upper pay in the Shinarump formation, but cored from 6,007-94 ft., and had a recovery of 11 ft. and 8 in., of which 3 ft. at 6,078-81 ft. was well saturated sand. Drilling then was resumed to go on to the Weber. The well is a west offset to Continental Oil Co. 1 Rooth, a producer in the Tensleep, and ⅓ of a mile northwest of 2 Rooth, a discovery a few months ago in the Shinarump sand, which on final report flowed 847 bbl. per day through a ½-in. choke at 6,110 ft., total depth. The Rooth well had two saturated zones in the Shinarump at 6,060-70 and 6,095-6,110 ft. It is on production and is held down to 200 bbl. per day, the field allowable.

An outpost on the southeastern side of the Rangely field is being completed as a producer in Stanolind Oil & Gas Co. 1 Hefley, SW NW NW 2-1n-102w. It is the first well drilled in Section 2, and is ¼ mile east of 2 Rector in Section 3, the nearest producer. It was drilled to 6,157 ft., and flowed 217 bbl. in 14½ hours through a 20/64-in. choke with the 2½-in. tubing at 6,140 ft. It is still testing.

New operations.—Twenty-one new operations were reported, of which five were in Colorado, all in the Rangely field; six in Wyoming, nine in Montana, and one in northwest New Mexico. The Wyoming locations include two at Byron, and one each at Middle Baxter Basin, Frannie, Spence and East Bailey. Last named is Wasatch Oil Refining Co.-Phillips Petroleum Co. 2 Cameron Unit 1, SW NW NW 24-26n-89w, East Bailey Dome, Carbon County, Wyoming. It is an exploratory well ¼ mile south of 1 Cameron, abandoned last July after testing the Tensleep at a total depth of 6,972 ft. It had some shows of oil, but was not commercial. Following its abandonment the area was core drilled and the new location is estimated 200 ft. higher. The Montana locations included three in Cut Bank, two in Kevin-Sunburst, and one each at Bowdoin, Cedar Creek, Pondera, and Kicking Horse. Last named was the only wildcat, being Husky Refining Co. 1 Henry, C SE NE 17-36n-1e, Kicking Horse District, Toole County. It is near 2 gas wells within a mile to the north, one of which came in for 20,000,000 cu. ft. per day. The new test is seeking oil which it is hoped to find on the flanks of the gas area. The New Mexico location is Petroleum Products Corp. 53 State, C SW SE 36-18n-9w, Hospah Dome, McKinley County. It is approximately three-fourths of a mile northwest of the discovery well drilled in 1927 by Midwest Refining Co., which had water in the Dakota at 3,282 ft., and plugged back and completed in the Hospah sand in the Mesa Verde for 240 bbl. The new well will

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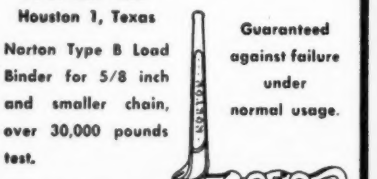

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go to the Dakota, the first to that horizon since the discovery was made.

Completions.—Twenty wells were completed, of which 13 were oil wells with initial production of 3,331 bbl., and 7 were gas wells. Six of the oil wells were in the Rangely field in Colorado, initial production being 2,138 bbl. In Wyoming 1 gas well was completed in North Baxter Basin, and 3 oil wells, 1 each in Frannie, Salt Creek and Hamilton, for 806 bbl. Montana had 8 completions, of which 4 were gas wells in the Bowdoin and Cedar Creek shallow fields, and 4 were oil wells for 387 bbl., 3 being in Cut Bank and 1 in Kevin-Sunburst. The New Mexico completions were 2 gas wells, 1 each at Blanco and Fulcher Basin.

MONTANA SUCCESSFUL WILDCAT

Kevin-Sunburst, Toole County: Big West Oil Co. 1 Proefrock, C NW NW 7-34n-4w, TD 2,364 ft., Ellis-Madison 2,361 ft., swabbed 15 bbl. per day.

TEXAS GULF COAST

Deep Gas Sand Found in Double Bayou Extension

HOUSTON.—A new deep gas sand was found in Humble Oil & Refining Co. 2-A Double Bayou Unit 2, Double Bavou extension well, Chambers County. This well is located in the R. O. W. McManus Survey, Abstract 187. On an initial test the well gaged 240 000 cu. ft. of gas with 7 bbl. of condensate daily through a ⅛-in. choke with 2.070 lb. flowing pressure on the tubing. Production is through 36 perforations at 9,000-07 ft. Total depth of the first hole was 10,347 ft., but pipe was stuck, necessitating a sidetrack job. New hole was bottomed at 9,130 ft., and 5½-in. casing is cemented at 9,100 ft.

O. J. Martin 1 H. B. McCrary et al, discovery well several miles southwest of the Clodine field of Fort Bend County, in Jas. Knight and W. C. White Survey, Abstract 46, has resulted in a small oil producer. No potential test has been made yet, but according to field reports, it is flowing around 50 bbl. of pipe-line oil daily through a 3/16-in. choke with very low and fluctuating gas pressures. Production is through perforations in saturated sands between 7.320-28 ft. Total depth is 7,625 ft. and 5½-in. casing is cemented to the bottom.

Hinkle Drilling Co. 1 G. M. Adcock, wildcat in John Stephenson Survey, 2 miles northwest of Port Neches field in Orange County, flowed 7 bbl. of 46°-gravity oil per hour through a ¼-in. choke on bottom and ⅛-in. choke on top, through perforations in the Lower Frio at 8,774-78 ft. Operators squeezed these perforations and are preparing for a new test. Total depth is 8,954 ft.

The 15 new locations reported this week include 4 wildcats, 1 each in Brazoria, Fort Bend, Matagorda, and Wharton counties. Brazoria and Jackson counties received three completions each while Chambers, Fort Bend, Liberty, Matagorda and Montgomery counties reported two each. There were nine oil wells, four gas, and six dry, including two new sands, one each in Chambers and Jefferson counties, four dry wildcats, two in Montgomery and one each in Jackson and Matagorda counties.

UPPER GULF COAST SUCCESSFUL WILDCATS

Chambers County: New gas-condensate sand in Double Bayou field:—Humble Oil & Refg. Co. 2-A Double Bayou Unit No. 2, R. O. W. McManus Sur., Abst. 187, TD 10,347 ft. in original hole, TD 9,130 ft. in sidetracked hole, perf. 9,000-07 ft., PT 240,000 cu. ft. of gas per day and 7 bbl. of condensate per day

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Jefferson County: New gas-condensate sand in Northwest Hamshire field: McCarthy Oil & Gas Corp. 4 W. C. Tyrrell Trust, in W. D. Dunshie Sur., TD 10,563 ft., perf. 10,238-252 ft., PT gaged 4,600,000 cu. ft. of gas and ungaged amount of condensate through ¼-in. choke, shut-in TP 3,600 lb., gravity 52°, no water.

UPPER GULF COAST WILDCAT FAILURES

Jackson County: Crown Central Pet. Corp. 1 L. H. Simon, 5,035 ft. from west, 375 ft. from north, and 1,250 ft. from east lines of 361.96-acre lease (N & E lines are shores of Carancahua Bay) dry, TD 9,050 ft.

Matagorda County: Salt Dome Oil Corp. 1-157 State of Texas, in Matagorda Bay, 10 mi. SW of Palacios, dry, TD 5,812 ft.

Montgomery County: McKay Donkin and Lloyd H. Smith 1 J. G. Browder, de la Garza Sur., 8 mi. E of Willis, dry, TD 10,001 ft.

Humble 3 E. L. Bender, Rayford area, Montgomery County School Lands Sur. 2, dry, TD 6,562 ft.

SOUTHWEST TEXAS

"Hutto" Sand Is New Pay Zone for Midway Field

CORPUS CHRISTI.—A new pay zone on the southwest flank at Midway field, San Patricio County, has been opened by F. M. Boykin, Jr. et al 1 H. H. Hutto. The new pay, to be known as the "Hutto" sand was topped at 5,107 ft. in sidetracked hole in this well, and perforated at 5,128½-30½ ft. for the completion. On initial test the well flowed 170 bbl. of oil per day through a 5/32-in. choke, tubing pressure 650 lb., casing pressure 900 lb., gas-oil ratio 400 to 1, with no water in the flow. Total depth of the first hole was 6,246 ft. With 5½-in. on bottom, casing collapsed and operators cut out to 3,500 ft. and sidetracked to the new depth of 5,143 ft. This well also tested oil in another possible new pay through perforations at 5,689-90 ft. in the original hole, recovering 2,000 ft. of oil and 160 ft. of salt water on drill-stem test which flowed oil with 850 lb. working pressure. While operators were squeezing these perforations, the casing collapsed, necessitating a sidetrack job.

A 14,000-ft. wildcat test in Gonzales County, about 10 miles southwest of Gonzales, in the William Newman Survey, Abstract 362, will be drilled by Quintana Petroleum Corp. et al. The test is 1 Alfred Speickermann, and operators are now rigging up.

There were 36 new locations reported this week, 10 being wildcats, 2 in Atascosa, 1 each in Bee, Gonzales, Jim Wells, Live Oak, McMullen, Zapata, Zavala, and Webb counties. Four of the 22 completions were wildcats, 1 a new sand at Midway field in San Patricio County, 3 dry holes, 1 each in Dimmit, Jim Hogg, and Karnes counties. San Patricio County received the greatest activity, reporting three producers. Brooks, Calhoun, and Duval counties each received two completions.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

San Patricio County: New oil sand Midway field; F. M. Boykin, Jr. et al 1 H. H. Hutto, NW NW Sec. 81, Geo. H. Paul's subdivision of Coleman-Fulton Pasture Co. lands, top Hutto sand 5,107 ft., perf. 5,128-30 ft., TD 5,143 ft., PT 170 bbl. oil per day through 5/32-in. choke, gas-oil ratio 400 to 1, TP 650 lb., CP 900 lb., no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Dimmit County: Humble 1-B J. C. Johnson, J. Delgado Sur. 598, in Carrizo Park area, dry, TD 3,193 ft.

Jim Hogg County: Humble 24 A. M. K. Bass, GC&SF Sur. 719, in Kelsey area, dry, TD 7,715 ft.

Karnes County: W. E. Kinnear 1 A. D. Wilborn et al, in Brooks and Burleson Sur. 3, 3 mi. SE of Runge, dry, TD 7,102 ft.

CANADIAN FIELDS

Steveville-Princess Field Gets Westward Extension

CHATHAM.—A westerly extension of the Steveville - Princess field in southern Alberta is indicated by Princess Brooks C.P.R. 1, LSD 13, 17-19-13w4. The test, with Madison lime at 3,319-61 ft. encountered water in that formation, and will plug back to test the Sunburst sand, where drill-stem test indicated around 1,700,000 cu. ft. gas with about 8 ft. of oil and mud in the drill stem. Location, about 7 miles west of the Princess field, is about 5 miles east of Brooks, and the gas production may be used to supplement the supply for that town. In the south extension of the Steveville field, South Princess Joint Venture 2, LSD 4, 4-19-11w4, plugged back to test the Madison at 3,265-3,300 ft., is making about 15 bbl. with a decreasing percentage of water.

Provost.—Possible extension of the Provost field in eastern Alberta to the east

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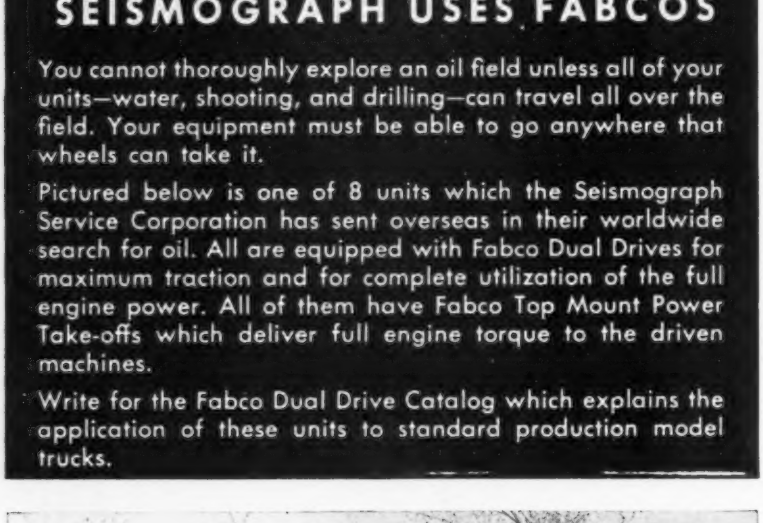

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and south is being sought by Commoil-Provost 1, LSD 5, 24-35-2w4. Location is about 11 miles south and 8 miles east of Imperial-Provost 1, discovery well which had initial production of 31 bbl. of 21.5°-gravity oil.

Pinhorn.—On the Pinhorn dome, close to the Montana boundary, McColl-Union 7-C joint test, LSD 7, 6-4-8w4, is coring in the Bow Island sand with indications of a good gasser, supplementing 2 previous completions aggregating 54,000,000 cu. ft. initial flow. McColl-Union 6-D has location in LSD 6, 12-4-8w4.

Imperial locations.—Two new areas in Alberta are being tested by Imperial Oil. In the central plains area, Imperial-Youngstown 1 has location in LSD 5, 3-30-9w4, and is moving drilling outfit from De Winton. North and west of the Viking-Kinsella field, Imperial-Deville 1 has been spotted in LSD 9, 36-51-20w4. Both areas are previously untested.

Jumping Pound.—In the southern Alberta foothills west of Calgary, the important Shell 16-14-J, LSD 16, 14-25-5w5, in the Jumping Pound area, which has been sidetracking lost tools, has recovered the Madison limestone at 10,329 ft. A drill-stem test at 10,364 ft. in slight porosity showed a small gas flow with neither water nor oil. The well is deepening below 10,388 ft. The discovery well, a short distance east and north, has a small light crude recovery from the Madison at 9,947 ft.

Hay River.—Work is being resumed on important drill operations in the Hay River area close to the northern Alberta boundary. Operations were started last spring by T. Boyd Kyle of Calgary in association with Calmont Oils, United Oils and Toronto interests. Five diamond drill structure tests were put down on a north-south cross-section across the structure to determine the anticlinal axis, which was found close to the fifth test. In three holes gas with pressure from 20 to 70 lb. was struck in the Slave Point limestone, and is believed to have migrated from the underlying Presqu'ile formation. Outcrops of the latter on the shores of Great Slave Lake, farther north, show bitumen and oil seepages. The original drilling outfit was destroyed by fire last May, but new equipment has been moved in to drill a series of tests along the strike to determine the extent of the structure. When the structure has been defined, a test will be drilled to the Presqu'ile formation, overlain by approximately 200 ft. of Slave Point limestone.

N. CENTRAL TEXAS

New Canyon Lime Pool Opened in Wilbarger

WICHITA FALLS.—Edward C. Lawson and Anderson-Prichard Oil Corp. 2 W. J. Baker, Section 85, Block 14, H&TC Survey, opens a new Canyon lime oil pool 5 miles south of Vernon in south central Wilbarger County. It has been completed for 92.56 bbl. of oil daily. Top of the Canyon lime was called at 3,245 ft., with total depth of 3,310 ft. Five and one-half-inch casing was cemented at 3,306 ft. National Associated Petroleum Co. 5 Schmoker, Section 111, Block 14, H&TC Survey, is a failure for the National Victory pool of southern Wilbarger County. It was dry at 3,468 ft. with no shows.

Standard Oil Co. of Texas 1 A. J. Mitchell, J. B. McAnair Survey, deep wildcat 1½ miles northwest of Sherman in Grayson County, with total depth of 11,542 ft., plugged back to 8,568 ft. and swabbed muddy water with a rainbow show of oil. Fluid level was 7,100 ft. from the top. Packer was then set at 4,350 ft. and perforated 31 holes from 4,330-40 ft. Operator was preparing to squeeze.

NuEnamel Oil Operating Co. staked a 7,000-ft. wildcat in eastern Montague Coun-

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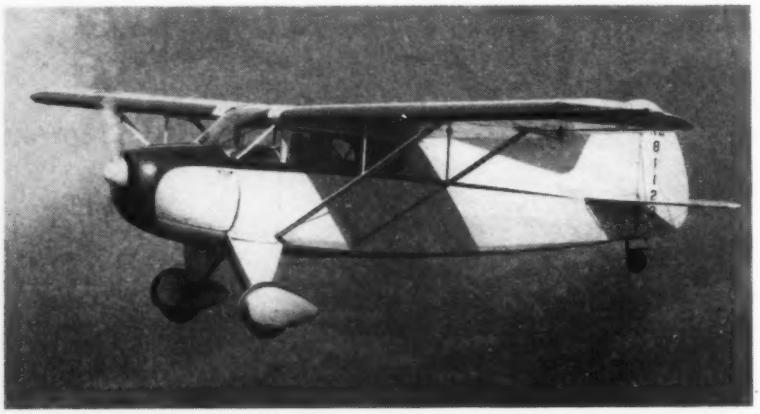
ty 2 miles due west of St. Jo. It is 1 George and Roy Perry, 510 ft. from the southeast line and 514 ft. from the southwest of a 40-acre lease in the L. F. Farrar Survey. Continental Oil Co. will drill a 6,000-ft. wildcat in southern Clay County. It is 1 Roscoe Scott, 367 ft. from the north and west lines of the east 207 acres of Block 3,239, TE&L Survey, 4 miles southwest of Vashti.

Wilson field, Cooke County, Electra field Wichita County, and National field, Wilbarger County, each had two completions this week. Holliday field, Archer County, and Burk field, Wichita County, each had three locations and Sunshine Hill field, Wichita County, had two. National field has eight drilling wells, Holliday field five, Sivell's Bend field, Cooke County, four, and Rose field, Haskell County, Woodbine field, Cooke County, Parrott field, Throckmorton County, each three.

In West Central Texas, Sanders pool, Shackelford County, and Ingram pool, Taylor County, each had one completion. Reddin field, Taylor County, had two locations and Merkel field, Taylor County, and Hatchett field, Stephens County, each had one. Jones County Regular field has six drilling wells; Manning - O'Conner field Stephens County, five, Reddin field, Taylor and Jones counties, four, and Cisco field, Eastland County, Sanders field, Taylor County, and Santa Anna field, Coleman County, two each.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Wichita County: New oil pay—W. H. Hammon and Hanlon-Buchanan 1 Parker, Sec. 26, Palo Pinto CSL, Madden pool, flowed 126 bbl. day through open hole from 5,248-68 ft. Ellenburger, gravity 42°, TD 5,268 ft.



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NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: L. Raymond Dawson, Jr. 1 L. Kinder, Lot 49, Blk. 5, Clark & Plumb Subd., 4 mi. E Archer City, elev. 958 ft., dry, TD 1,200 ft.

Cooke County: R. B. Hollandsworth 1 W. R. Thornton, L. C. Gibbs Sur., 1 mi. N and 2 mi. W Marysville, elev. 959 ft., dry, TD 1,465 ft.

Shell 1 W. H. Donnelly, Jas. Neeley Sur. A-796, ½ mi. S and W Burns City, elev. 723 ft., Ellenburger 3,344 ft., dry, TD 3,382 ft.

J. L. Tippett 1 Philip Miller, W. Hester Sur. A-1200, 3 mi. W and 3½ mi. S Valley View, elev. 798 ft., Ellenburger 1,415 ft., dry, TD 2,380 ft.

Montague County: Continental 1 Ray Stephens, P. H. Dooley Sur. A-1148, 2 mi. SW Bowie, elev. 1,052 ft., Caddo 5,952 ft., Barnett 6,500 ft., dry, TD 6,975 ft.

Wichita County: Ashton et al 2 J. A. and S. M. Dixon, SA&MG Sur. A-275, 3 mi. E Electra, elev. 1,142 ft., dry, TD 1,557 ft.

A. E. Blair 1 Honaker Est., Sec. 8, GC&SF Sur. A-764, 1 mi. N and 5 mi. E Electra, dry, TD 2,030 ft.

Wilbarger County: Frank Wood 1 D. A. Melton, Sec. 9, Blk. 5, H&TC Sur., 2 mi. E and 8 mi. S Harrold, dry, TD 2,506 ft.

Young County: A. R. Dillard 1 H. E. Griffin, Jas. Shelton Sur. A-249, 8 mi. N and 2 mi. E Eliasville, elev. 1,101 ft., Chappel 4,590 ft., dry, TD 4,661 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Coleman County: New oil pool—Coleman Oil & Gas 1 E. W. Moore, Wharton CSL Sur. No. 496, 4 mi. SE Santa Anna, elev. 1,559 ft., pumped 77 bbl. day at 1,464-75 ft. Fry, gravity 30°, TD 1,475 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Shackelford County: Bennett & Sorrells 1 R. A. Elliott, Sec. 88, BAL Sur., 5 mi. NE Sedwick, elev. 1,398 ft., Ellenburger 4,476 ft., dry, TD 4,520 ft.

Taylor County: West Central Drlg. 1 J. D. Sandusky, Sec. 5, Blk. 18, T&P Sur., 2 mi. S Merkel, elev. 1,922 ft., Swastika 3,064 ft., dry, TD 3,197 ft.

CALIFORNIA

New Test for South Dome At Kettleman Hills

LOS ANGELES.—The trend to bolder exploratory operations was continued this week, featuring another attempt to develop production on the South Dome at Kettleman Hills.

Tide Water Associated Oil Co. made location for 65-18 fee, 2,310 ft. north and 3,630 ft. east from the SW cor. 18-25s-20e, and plans to drill to approximately 9,000 ft. The location is about 1 mile southeast of the Los Nietos Producing & Refining Co. 41 South Dome, 13-25s-19e, which was declared dry in 1945, after getting the Temblor at 7,350 ft. and showings of oil and gas at 7,465-97 ft. Another failure was Continental Oil Co. 28-7 Gatchell, 7-25s-20e, abandoned in 1935 at 7,849 ft. The Continental test topped sand at 5,626 ft. and recovered water and gas-cut mud from 5,275 to 5,702 ft. Subsequent tests at 6,903 and 7,849 ft. resulted in flowing hot salt water.

Testing operations continued at The Texas Co. 3 Holmes-Eureka in 22-3n-1w, Tompkins Hill area of Humboldt County. The well has tested wet following perforating operations at 7,755-61, 7,771-81, and 7,450-84 ft. The lower perforations have been squeezed off and testing is under

way through another series at 5,660 to 5,710 ft.

Texas Co. has made location for 1 Anderson in 8-2n-1e, in the Hydesville area, Humboldt County, for its next wildcat venture on extensive acreage holdings.

Another well has been authorized in the recently discovered Gardena area, Los Angeles County. The Texas Co. and Seaboard Oil Co. will drill 9-1 Gardena Community, 990 ft. south and 900 ft. east of the NW cor. 26-3s-14w, approximately ½ mile southeast of the discovery well. British-American Oil Producing Co. and Texas Co. 1 Bodger, the Gardena discovery, currently produces 555 bbl. per day of 26.7° crude through 13/64-in. choke.

Testing operations are under way at Basin Oil Co. 1 Standard Brick, a deep Miocene project in the Inglewood area, Los Angeles County. Operators cemented 7-in. pipe on bottom at 9,935 ft., and plan to test various intervals in the Miocene topped at 9,059 ft.

Much interest persists around the deep test at South Belridge in Kern County. Belridge Oil Co. 62-W-33, in 33-28s-21e, is drilling at 13,779 ft. and operators are withholding all geological information. Rumors persist that the well "looks good" and that "interesting results" are expected.

New locations slumped last week to 42, a reduction of 20 from the previous week which was a new high for the year. New operations announced last week featured seven new projects by Long Beach Oil Development Co. on its W, X and Y parcels in the Wilmington pool, Los Angeles County, which continues as the most active field in the state.

The Huntington Beach area of Orange County has five active drilling operations, four in the immediate vicinity of the A. W. Lyddon discovery well on Anaheim Sugar Co. fee land, completed several weeks ago.

UNSUCCESSFUL CALIFORNIA WILDCATS

Ventura County, Triunfo area: Bennett Exploration Co. 2 Triunfo, 24-1n-19w, flowed and bailed water on tests at 3,195 and 2,100 ft., TD 3,195 ft., converting to water well.

Kern County, Ant Hill area: Amerada Petroleum Corp. 38-10 Barnett, 10-29s-29e, dry, top Olcese 1,720 ft., Pyramid Hills 3,782 ft., schist 4,245 ft., TD 4,280 ft.

McClure Valley area: National Investors Fund, Inc., 1 Orchard, 5-25s-18e, top Point of Rocks 1,447 ft., TD 2,036 ft., dry.

Grapevine area: Oceanic Oil Co. 1 KCL, 22-10n-20w, dry, gray sand, TD 2,816 ft.

OHIO, KENTUCKY

Fourth Well Drilled in New Oriskany Pool

COLUMBUS. — The fourth well to be drilled in in the new Oriskany pool in Madison Township, Columbiana County, C. A. Smith 1 Bert Dailey, Section 14, reached the sand at 4,427 ft. and at 4,437 ft. gaged 4,500,000 cu. ft. After tubing this well, the operator will move to a location on R. E. George in Section 10.

John Morrow et al drilled in their wildcat on Eugene Good, Section 25, in the southeast part of Newton Township, Muskingum County, with a good show of oil. The Clinton sand, logged at 3,728-88 ft. was shot with 100 qt., but the production has not yet been reported.

Ohio Fuel Gas Co.'s attempt to extend the Brush Creek field ½ mile south resulted in a small gas well on Frank Kuntz, Section 27, Deerfield Township, Morgan County. Clinton sand at 4,275-306 ft. gaged 206,000 cu. ft. which will be shot.

The Hemlock Grove pool in Meigs County continues to reach out to the south.

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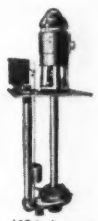

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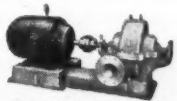

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Nollem O. & G. 4 E. R. Heaton, Section 1, Bedford Township, made 40 bbl. oil and 150,000 cu. ft. gas in 24 hours. Berea sand was logged at 1,688-703 ft.

A total of 29 locations were reported for the week with Lancaster field having 7, Cambridge 6, Stewart 5, Brush Creek 4, and Sandyville and Mt. Vernon 2 each. Of 27 wells completed, Cambridge led with 7.

OHIO WILDCAT FAILURE

Carroll County, East Township: Frank Lyons 1 Clyde Allen, Sec. 8, no Oriskany, TD 4,310 ft.

EASTERN KENTUCKY

ASHLAND.—Martin County came into the completion spotlight during the past week, with 2 wells drawing more than 1,000,000 cu. ft. of gas daily in Salt sand.

Kentucky-West Virginia Gas Co. completed Well No. 5,682 on the Carlisle Lands, Martin County, at 766 ft. for 1,713,000 cu. ft., and Well No. 5,684 on the J. S. Mollett property, Martin County, at 569 ft., for 1,050,000 cu. ft. The same company also completed Well No. 5,646 on the Jeptha Hagins property, Knott County, 3,373 ft., for 207,000 cu. ft. in shale.

WESTERN KENTUCKY

OWENSBORO.—Operations in the Western Kentucky area were quiet during the past week, with none of the exploratory ventures reaching critical depths. Five completions were reported for the week and included a 50-bbl. well in the Burbank Chapel field, a 55-bbl. well in the Uniontown field, a gas well in the Dixie pool and a dry wildcat in Webster County. New tests announced totaled four, located one each in Henderson, Daviess, Union and McLean counties.

WESTERN KENTUCKY WILDCAT FAILURE

Webster County: Bartmes-Pollack 1 Jennie Duncan, 17-N-23, elev. 442 ft., dry at 1,953 ft., Menard 1,714 ft., Viola 1,874 ft., Tar Springs 1,924 ft.

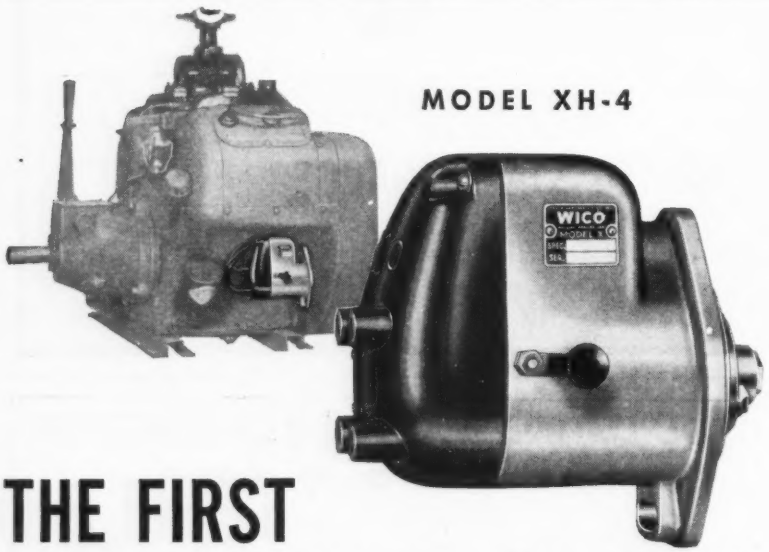
INDIANA

EVANSVILLE.—Continental Oil Co. et al have temporarily abandoned the 1-D Cooper Estate, SW SW 13-3s-14w, after unsuccessful attempts to develop commercial production from the St. Louis lime. The 1-D Cooper Estate was the first deep test drilled in the Griffin pool of Gibson County, and was drilled to a total depth of 6,408 ft. without finding saturation in any of the lower horizons encountered. It was subsequently plugged back to test saturation found in the St. Louis zone.

Indiana completions during the past week totaled eight, of which four were oil wells and four were dry holes. Completions for the preceding week, which were not previously reported, totaled 10, of which 6 were oil wells and 4 were dry. Eight new operations were announced during the past week, of which two were wildcats, one each in Vanderburgh and Posey counties.

INDIANA WILDCAT FAILURE

Gibson County: Continental et al 1-D Cooper Estate, SW SW 13-3s-14w, dry at 6,408 ft., temporarily abandoned, elev. 377 ft.



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ILLINOIS

Active Drilling Campaign Under Way in Lawrence Co.

MATTOON.—Recent completion of the Steve Zanetis 2 Powell, SW NW NW 23-3n-11w, Lawrence County, has renewed interest in this area and an active drilling campaign is now under way. The 2 Powell, completed in the Rosiclare at 1,856-63 ft. for an initial gage of 550 bbl. of oil daily, is now producing approximately 250 bbl. per day on pump. Prior to completion, this well swabbed at the rate of 900 bbl. daily. As a result of the good production, drilling has started at five wells nearby and locations have been staked for four others. This is the first active play in Lawrence County in many months, although various pools in the county have been producing oil for nearly 30 years.

The M. J. Lewis 1 Questell, SW SE NW 11-7s-9e, is showing for the best well in that area to date. Following an acid treatment of 2,000 gal. in the McClosky lime at 2,981-87 ft., total depth, the 1 Questell flowed at the rate of 53 bbl. of oil an hour. It is located on the eastern edge of the Herald pool, and operators are continuing to test.

North of the Mattoon pool in Coles County, A. F. Degler is installing pump at his 1 fee, SE SE SE 3-12n-7e, for a test of the Cypress sand at 1,716-31 ft., total depth 1,761 ft. Following a 20-qt. shot at 1,733-40 ft. and a 10-qt. shot at 1,741-46 ft., the 1 fee swabbed oil at the rate of 4 bbl. per hour. If successfully completed, this well will extend the productive limits of the Mattoon pool about ½ mile to the north.

Illinois completions remained at a high level during the past week, with 21 oil wells and 26 dry holes reported. These included 11 dry wildcats. New operations announced during the week totaled 57, more than offsetting the completions. The new operations included 13 exploratory tests, located 2 each in Clay, Clinton, Cumberland and Fayette counties, and 1 each in Edwards, Franklin, Hamilton, Lawrence and White counties.

ILLINOIS WILDCAT FAILURES

Bond County: Halbut & Doran 1 G. F. Jones, NW SW NW 8-4n-3w, dry at 2,031 ft., Glen Dean 1,665 ft., Cypress sand 1,846 ft., Benoist 1,967 ft.

T. M. Conrey 1 Hediger, NE NW NE 20-4n-2w, dry at 1,316 ft., Cypress sand 1,846 ft., Benoist 1,967 ft.

Brown County: S. M. Levine 1 Kroft, SW SW NW 4-1n-3w, dry at 675 ft., Maquoketa 495 ft., Trenton 675 ft.

Effingham County: Inland Producers 1 C. White, SW SW NE 23-7n-5e, dry at 2,478 ft., Tar Springs 1,886 ft., Glen Dean 1,940 ft., Cypress sand 2,102 ft., Benoist

2,251 ft., Aux Vases sand 2,310 ft., Ste. Genevieve 2,366 ft., Rosiclare 2,385 ft., Fredonia 2,399 ft., McClosky 2,405 ft.

Jasper County: Russell Johnson 1 G. C. Miller, SE SE NE 32-7n-10e, dry at 2,851 ft., Glen Dean 2,296 ft., Cypress sand 2,502 ft., Paint Creek 2,588 ft., Benoist 2,647 ft., Aux Vases 2,736 ft., Ste. Genevieve 2,767 ft., McClosky 2,796 ft.

National Associated Pet. Co. 1 H. T. Payne, NE SE NE 16-7n-9e, dry at 2,995 ft., Tar Springs 2,246 ft., Glen Dean 2,334 ft., Cypress sand 2,560 ft., Benoist 2,683 ft., Renault 2,748 ft., Aux Vases sand 2,756 ft., Ste. Genevieve 2,814 ft., Rosiclare 2,828 ft., Fredonia 2,851 ft., McClosky 2,858 ft., St. Louis 2,982 ft.

Jefferson County: Ashland O. & R. 1 Martin Irvin, SE NW SW 24-4s-4e, dry at 3,471 ft., Glen Dean 2,673 ft., Renault 3,155 ft., Aux Vases 3,207 ft., Ste. Genevieve 3,269 ft., Fredonia 3,323 ft.

Madison County: Aetna Oil et al 1 Ashaver, NW NE NE 29-4n-6w, dry at 1,925 ft., Ste. Genevieve 900 ft., Devonian 1,800 ft.

Moultrie County: Ben J. Taylor 1 R. M. Butler, SW SW SW 16-12n-6e, dry at 2,106 ft., Glen Dean 1,682 ft., Cypress sand 1,802 ft., Aux Vases 1,946 ft., Ste. Genevieve 1,990 ft., Fredonia 2,026 ft., McClosky 2,144 ft.

Shelby County: Pure 1-A F. E. Walker, SW NW SE 16-12n-5e, dry at 2,130 ft., Glen Dean 1,616 ft., Cypress sand 1,728 ft., Aux Vases 1,891 ft., Ste. Genevieve 1,937 ft., Rosiclare 1,950 ft., McClosky 2,020 ft.

Wayne County: J. W. Menhall 1 C. R. Stein, SE NE SE 18-1n-8e, dry at 3,230 ft., Tar Springs 2,448 ft., Glen Dean 2,564 ft., Cypress sand 2,746 ft., Benoist 2,966 ft., Renault 3,002 ft., Aux Vases sand 3,035 ft., Ste. Genevieve 3,076 ft., Fredonia 3,124 ft., McClosky 3,126 ft.

LA.-ARK.

DeSoto Parish Wildcat to Complete in Travis Peak

SHREVEPORT.—Jarvis, Marcell and Schoonmaker's wildcat, 1 N. B. James, in 4-11n-14w, 6 miles southwest of Mansfield in De Soto Parish, set casing at 6,820 ft. in the Travis Peak late last week and after testing in that zone, announced that completion would be made in the Rodessa gas and distillate zone where 12 ft. of porosity had been found between 4,809-29 ft. The test had previously tested the Pettit at 6,448-65 ft.

In Caddo Parish, Joe Burnham et al 1 Noel, SE NW 11-19n-16w, was a disappointment as extensive drilling was planned on the strength of a good producer being found. The test is reported as shut down for orders. Other zones may be tested higher on the horizon.

In Arkansas, a small sand well may revive the long dormant Urbana field of east central Union County. Creslenn Oil Co. 4 Gus Norman, SW SE NE 3-18s-13w, on the north edge of the field, pumped 25 bbl. of oil a day at 3,180-85 ft.

Permits issued for new wells in Arkansas last week were: Four wells in the Wesson field, two in Columbia field, and one in the Lafayette field.

NORTH LOUISIANA WILDCAT FAILURE

Richland Parish: James A. Goin et al 1 H. B. Balfour, C NE SW 22-18n-7e, dry, TD 3,520 ft., Wilcox 1,333 ft., Midway 2,106 ft., chalk 2,596 ft., Travis Peak 2,622 ft.

ARKANSAS WILDCAT FAILURE

Nevada County: Spartan Drilling Co. 1 J. W. Plumbley, C SW SE NE 9-15s-22w, dry, TD 4,483 ft., Nacatoch 1,695 ft., fault 2,040 ft., Tokio 2,140-50 ft., Cotton Valley 4,150 ft., Tokio sand 2,343-55 ft. and 2,374-80 ft.

KANSAS

Exploratory Activity At Peak in Rush County

RUSH County, which has been the scene of considerable wildcat activity during the present year, continues to hold its lead with a large amount of exploratory work projected for the last quarter. Darby & Bothwell, Inc., have announced plans to drill three wildcats in the county and have staked location for the 1 Sankey, SW SW SW 18-17-18w, about 3½ miles northwest of La Crosse. It is on a block of about 1,200 acres. In addition, several other exploratory tests are planned by various concerns throughout the central and western parts of the county. Leasing is very active in this section and several large blocks are being formed.

The second dry hole for the new Webster pool of Rooks County was recorded last week when the Amerada 1 Lowry, NE NE 33-8-19w, reached a total depth of 3,487 ft. without encountering commercial saturation. The 1 Lowry is the southwest offset to the discovery well and is ½ mile west of another dry hole drilled by the Sinclair Prairie Oil Co. The northeast offset to the discovery, however, the Bird & Boreing 2 Veverka, NE SW SW 27-8-19w, is showing for a good producer with latest reported gages showing it to be swabbing at the rate of 35 bbl. per hour from a total depth of 3,411 ft. Production in the pool is obtained from the Arbuckle lime.

Highlight of Kansas activity during the past week was the completion of 18 gas wells in the Hugoton pool in the southwestern part of the state. This is the largest number of completions reported for

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any one week during the current year, and climaxes considerable work done in the pool. In addition, 15 oil wells and 12 dry holes, including 9 dry wildcats, were reported during the week.

KANSAS WILDCAT FAILURES

Barton County: J. M. Huber Corp. et al 1 Rusco, SW SW SW 3-19s-12w, dry, TD 3,461 ft., anhydrite 660 ft., Heebner 2,992 ft., brown lime 3,103 ft., Lansing-Kansas City 3,118 ft., conglomerate 3,375 ft., Arbuckle 3,387 ft.

Butler County: E. H. Adair 1 Stolli, NW NW SW 22-25s-3e, dry, TD 2,824 ft., Lansing-Kansas City 2,025 ft., conglomerate 2,740 ft., Mississippi lime 2,772 ft.

Dunne & Strait 1 Kistler, SW SW NE 27-26s-6e, dry, TD 2,829 ft., Lansing-Kansas City 1,830 ft., Kansas City 2,145 ft., Mississippi lime 2,804 ft.

Cowley County: Ashland Oil and Goodpasture Drilling 1 Frye, SE NW NE 23-31s-3e, dry, TD 3,340 ft., Kansas City 2,440 ft., Mississippi lime 3,011 ft., Arbuckle 3,330 ft.

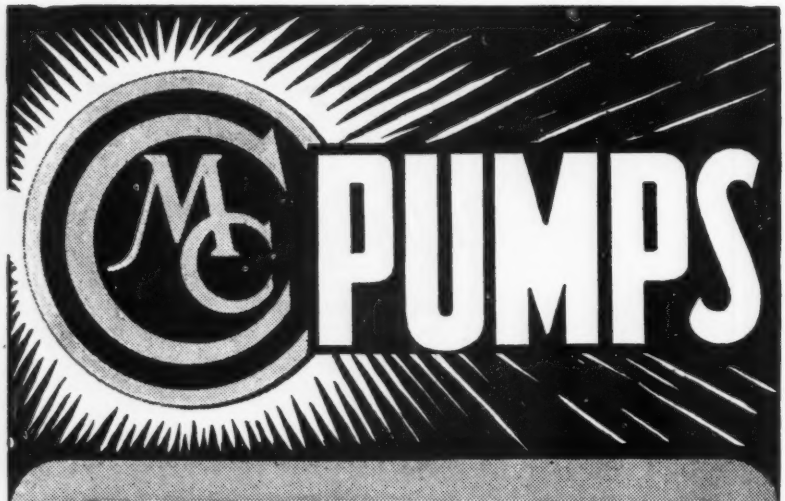
Ellis County: Doley Oil 2 Kippes, C W/2 SE SE 20-13s-16w, dry, TD 3,550 ft., anhydrite 1,085 ft., Topeka 2,955 ft., Lansing-Kansas City 3,222 ft. with a show of oil, conglomerate 3,475 ft.

Graham County: Cities Service Oil 1 Rome, SE SW SW 27-9s-25w, dry, TD 4,600 ft., Topeka 3,546 ft., Heebner 3,720 ft., Lansing-Kansas City 3,760 ft., Basal Kansas City 3,987 ft., conglomerate 4,303 ft., Mississippi lime 4,363 ft., Viola 4,474 ft., Arbuckle 4,495 ft.

Marion County: S & S Oil et al 1 Meisinger, NW NW SW 22-20s-4e, dry, TD 2,620 ft., Topeka 1,105 ft., Lansing-Kansas City 1,689 ft., Mississippi lime 2,203 ft., Kinderhook 2,275 ft., Chattanooga 2,431 ft., Misener 2,455 ft., Maquoketa 2,456 ft., Viola 2,480 ft., Simpson sand 2,564 ft.

Norton County: Helmerich & Payne 1 Baird "A," C S/2 SW NW 24-5s-21w, dry, TD 3,695 ft., anhydrite 1,740 ft., Heebner 3,308 ft., Lansing-Kansas City 3,336 ft., Arbuckle 3,586 ft., Layton sand 3,673 ft.

Rush County: Sohio Oil and Jones-Shelburne 1 Schneider, SW SW NW 6-16s-18w, dry, TD 3,628 ft., anhydrite 1,165 ft., Topeka 3,004 ft., Heebner 3,236 ft., Lansing-Kansas City 3,275 ft., conglomerate 3,560 ft., Arbuckle 3,565 ft.



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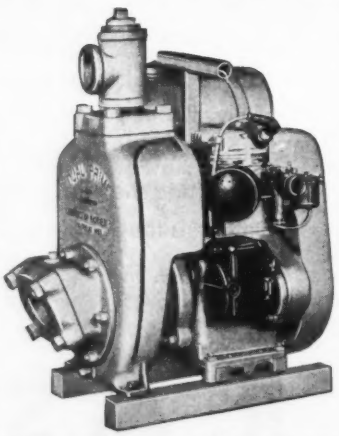

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OKLAHOMA

Cache Creek Extension Estimated at 300 Bbl.

ANOTHER eastern extension of the Cache Creek pool of Cotton County seemed definitely assured last week with the report that the William Ungerman et al 1 Campbell, SW SW NW 4-4s-10w, had encountered excellent oil saturation in a sand at 1,394 ft. Pipe has been set on top of the sand at 1,388 ft. and crew is now drilling plug. The well has been estimated as capable of producing 300 bbl. of oil daily. It is located about ½ mile east of the 1 Choate, NW NW SE 5-4s-10w, a good oil discovery which is believed to be a 1-mile east extension of the Cache Creek productive area.

Meanwhile, the Oklahoma Corporation Commission has approved recommendation that both the Essaquanahdale and Cache Creek pools be placed on the prorated list. Cache Creek is now producing approximately 4,000 bbl. of oil daily and Essaquanahdale is making 700 bbl. daily. Other pools placed on the prorated list during the recent meeting of the Commission were the Gar Creek pool, Seminole County, 500 bbl.; Chitwood pool, Grady County, 300 bbl.; Slick Extension, Creek County, 1,000 bbl.; Southwest Wayne, McClain County, 400 bbl.; and the Wilzetta pool of Lincoln County, 1,650 bbl.

Following running of an electric log, the Oklahoma Natural Gas Co. has ordered testing of a Pennsylvanian sand which showed oil and gas in its Dewey County wildcat, the 1 Oakwood Unit, NW NW NW 6-17n-14w. During the course of drilling a sand showing some free oil was encountered at 7,910-8,020 ft., and a lime zone which showed for 500,000 cu. ft. of gas was found at 9,476-9,500 ft. The wildcat was drilled to a total depth of 12,610 ft., logging the Wilcox sand at 12,240-12,590 ft.

The Oklahoma section of the large Hugoton gas field has been extended approximately 3 miles to the west by the Cities Service Oil Co. 1 Buzzard, 22-4n-12ecm, Texas County wildcat. Following an acid treatment through perforations at 2,604-24 ft., the well was reported blowing 867,000 cu. ft. of gas daily. Operator plans to reacidize before completion.

Carter Oil Co. 1 Bruford, NW NW 5-1n-1w, prospective wildcat producer northeast of Katie in Garvin County, is reported drilling ahead below 7,230 ft. after a drillstem test of the Viola at 7,148-90 ft. recovered only load water and a little gas-cut mud. Good oil shows have been found in the Deese Pennsylvanian sand and in the Hunton.

OKLAHOMA SUCCESSFUL WILDCATS

Cleveland County: Kerwood & Schermerhorn 1 Hummell, SW SW SE 28-10n-3w, discovery well, flowed 260 bbl. of oil per day through ¾-in. tubing choke from Burgess at 7,879-8,012 ft., Pawhuska 4,350 ft., Hoshooter 5,800 ft., Layton 5,887 ft., Oolitic 6,633 ft., 2nd Oolitic 6,790 ft., Oswego 7,480 ft., sand

7,876 ft. with slight stain of oil, TD 8,012 ft.

Pittsburg County: J. C. Craig 1 Wilkins, NW NW NW 8-2n-16e, pumped 4 bbl. of 36.5° oil per day from sand at 271-91 ft., sand 204-25 ft. with show of oil and 271-89 ft. with show of oil, TD 335 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Hedrick Bros. 1 Brinlee, SE SE NE NW 13-4s-11w, dry, TD 1,453 ft., no tops reported.

J. E. Jackson 1-A Bone, NW SW SW 8-4s-10w, dry, TD 1,455 ft., sand 1,355-65 ft.

E. W. Whittaker et al 1 Simmons, C NE SW 9-4s-11w, dry, TD 1,665 ft., no tops reported.

Creek County: W. J. Sherry 1 Lashley-Johnson, SE SW NE 20-16n-8e, dry, TD 3,880 ft., lime 1,325-45 ft. with show of oil, sand 1,795-1,800 ft., Cleveland 1,805-35 ft., Oswego 2,470-95 ft., Prue 2,495-515 ft., lime 2,570-75 ft., broken sand 2,600-24 ft., Red Fork 2,624-64 ft., Bartlesville 2,993-3,137 ft., Mississippi lime 3,366 ft., Woodford 3,736 ft., Viola 3,815 ft., Wilcox 3,875 ft.

Greer County: Tom Greer 1-A McLeod Estate, NW SW NE NW 32-6n-21w, dry, TD 645 ft., sand 640-45 ft. with a show of free oil.

Jefferson County: W. E. Miller 1 Liza Washington, NW NE NW 29-6s-7w, dry, TD 2,607 ft., sand 1,645-702 ft., 1,708-12 ft., 1,722-28 ft. and 1,740-50 ft., sand and shale 1,750-812 ft., sand 1,812-18 ft. and 1,931-59 ft., sand and shale 1,983-2,054 ft. and 2,252-330 ft., lime 2,508-10 ft., hard sand and chert 2,562-90 ft., hard sand and shale 2,590-607 ft.

Lincoln County: L. B. Jackson and R. L. Kemp 1 G. W. Biles Estate, SW SW SW 25-16n-4e, dry, TD 4,187 ft., Perry 2,260 ft., Hogshooter 2,550 ft., Layton 2,600 ft., Checkerboard 2,870 ft., Cleveland 2,911 ft., Oswego 3,510 ft., Prue 3,575 ft., Verdigris 3,650 ft., Skinner 3,721 ft., Red Fork 3,853 ft., Mississippi lime 4,160 ft.

Logan County: Harper & Turner 1 M. L. Watts, C SE NE 4-17n-2w, dry, TD 6,018 ft., Hogshooter 4,430 ft., Oswego 4,685 ft., Mississippian 5,287 ft., Woodford 5,576 ft., Misener 5,641 ft., Sylvan 5,650 ft., Viola 5,737 ft., Simpson 5,791 ft., dolomite 5,817 ft., 1st Wilcox 5,906 ft., 2nd Wilcox 5,994 ft.

Pawnee County: Wofford, Nicholson and Rose Drilling Co. 1 High Eagle, NW SW NE 5-20n-5e, dry, TD 85 ft., no tops reported.

Seminole County: Big Chief 1 Stockton, SE SW NE 1-6n-5e, dry, TD 4,476 ft., sand 1,269-76 ft. with a show of oil, Calvin 2,345 ft., Senora sand 2,603 ft., Senora lime 2,645 ft., Earlsboro sand 2,777 ft., Upper Cromwell 3,147-63 ft., Lower Cromwell 3,194-206 ft., Mississippi lime 3,760 ft., Woodford 3,859 ft., Sylvan 4,093 ft., Viola 4,167 ft., dense 4,226 ft., dolomite 4,287 ft., 1st Wilcox 4,349-71 ft., 2nd Wilcox 4,472 ft.

MISSISSIPPI

Brookhaven Field Paces Rising Development

JACKSON.—Production extensions and encouraging tests place Brookhaven field in the center of increasing development interest in Mississippi. Roeser & Pendleton 1 Cora M. Ballard, SW SW 17-7n-7e, Lincoln County, flowed approximately 1,008 bbl. of 39.5°-gravity oil per day through a 5/16-in. tubing choke from 55 ft. of oil sand. The same company has staked three new locations for further attempts to extend production in the field. Danciger Oil & Refining Co. 1 V. G. Allen, SE SE 5-7n-7e, has encountered tight to slightly porous sand with oil shows. Sun Oil 1 Leon Case, 17-7n-7e, perforated at 10,306-15 ft., recovered some oil but no flow after swabbing, and is installing pump at total depth of 11,101 ft.

In the Heidelberg field, pump is being installed on Frank & George Frankel 1 T. M. Cranford Unit, 6-10n-10w, the 118th producer for the field. Sohio-Roeser & Pendleton 1 Baker-Beach, 34-6n-2w, Adams County, LaGrange field, cored Wilcox at 4,352 ft., 15 ft. lower than the 1 Baker-Maier, discovery well for the field, and in Baxterville field, Gulf-Welch 1 John Q. Butler, 32-2n-16w, Lamar County, sampled chalk at 6,561 ft. with a relative certainty of gas production in Upper Tuscaloosa as well as oil production in the stringer sands of the Massive zone. Plans for new oil tests in Jasper and Jeff Davis Counties were announced by Gulf Refining Co. last week: in the Heidelberg field, roads are under construction at Gulf's 1 McDonald-Smith unit in SW SW NE 35-1n-12e; the other location is the 1 T. B. Slater, SE NW 36-9n-19w, in the Gwinville field.

MISSISSIPPI WILDCAT FAILURES

Newton County: Magnolia Petroleum Co. 1 State "A" Lease, NW NW 16-5n-10e, dry, TD 6,447 ft., Winfield 737 ft., Wilcox 1,018 ft., Midway 3,110 ft., conglomerate 3,450 ft., Eutaw 4,519 ft., Tuscaloosa 4,958 ft., Marine Tuscaloosa 5,787 ft., Massive sand 6,047 ft.

Sharkey County: C. H. Murphy, Jr. and Sun Oil Co. 1 H. T. Greer, C NW NW 22-13n-6w, dry, TD 4,517 ft., no tops reported.

FLORIDA WILDCAT FAILURE

Volusia County: Sun Oil Co. 1 Powell Land Co., NE SW SW 11-17s-31e, dry, TD 5,961 ft., no tops reported.

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CALENDAR OF EVENTS

October

American Society of Mechanical Engineers, 3-day national conference on petroleum mechanical engineering, Mayo Hotel, October 7-9.

Thirty-fourth National Safety Congress and Exposition, Stevens Hotel, Chicago, October 7-11.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

California Natural Gasoline Association, twenty-first annual meeting, Ambassador Hotel, Los Angeles, October 11.

Western Petroleum Refiners Association, regional technical meeting, Washington-Youree Hotel, Shreveport, La., October 11.

Houston Nomads, Old College Inn, Houston, October 14.

East Texas chapter, American Petroleum Institute, fall meeting, October 15, Kilgore.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18.

Texas Railroad Commission, state-wide proration hearing, Austin, October 19.

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Ambassador Hotel, Los Angeles, October 24-25.

American Association of Petroleum Geologists, midyear meeting, Buena Vista Hotel, Biloxi, Miss., October 24-25.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

Midwest Gas Association and Iowa State College Gas School and Conference, Ames, Iowa, October 28-30.

November

Los Angeles Nomads, Fall Festival, Mayfair Hotel, Los Angeles, November 2.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

Houston Nomads, Old College Inn, Houston, November 11.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

American Society for Metals, annual meeting, and National Metal Exposition, Atlantic City, N. J., November 18-22.

American Welding Society, annual meeting, Atlantic City, N. J., November 18-22.

American Institute of Mining and Metallurgical Engineers, iron and steel division, and institute of metals division, annual fall meeting, Atlantic City, N. J., November 18-22.

Mid-Southeastern Gas Association, Raleigh, N. C., November 21-22.

Rocky Mountain Oil and Gas Association, annual meeting, Shirley-Savoy Hotel, Denver, November 21-23.

December

American Society of Mechanical Engineers, New York, December 2-6.

New Mexico Oil and Gas Association, annual membership meeting, Artesia, N. M., December 4.

Houston Nomads, Old College Inn, Houston, December 9.

Interstate Oil Compact Commission, winter quarterly meeting, Dallas, December 9-11.

Oil Dealers Association of Arkansas, Hotel Marion, Little Rock, December 10.

Los Angeles Nomads, Mayfair Hotel, December 11.

1947

January

Society of Automotive Engineers, annual meeting and engineering display, Book-Cadillac Hotel, Detroit, January 6-10.

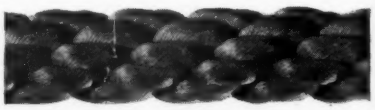
March

American Institute of Mining and Metallurgical Engineers, annual meeting, and World Conference on Mineral Resources, Waldorf Astoria Hotel, week of March 17.

Western Metal Congress and Exposition, Oakland, Calif., March 22-27, 1947.

April

National Association of Corrosion Engineers, annual convention, Palmer House, Chicago, April 7-10, 1947.



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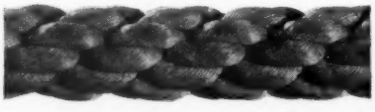

Statement of the Ownership, Management, Etc., of
THE OIL AND GAS JOURNAL
October 5, 1946

(This statement is published in compliance with the Act of August 24, 1912.)

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Known bondholders, mortgagees and other security holders holding 1 per cent or more of the total amount of bonds, mortgages or other securities: None.

S. H. ROURKE,
Business Manager.

Sworn to and subscribed before me this 27th day of September, 1946.

JOHN P. GALLAGHER,
Notary Public.

My commission expires March 1, 1947.

Trinidad Leaseholds

(Continued from page 46)

pending on the type of oil and the initial pressure conditions in the reservoir. However, in some recently developed reservoirs, strict control is leading to gravity drainage and the formation of secondary gas caps, and here higher recoveries are anticipated, possibly up to 500-600 bbl. per acre-foot. To aid in proper reservoir control, all new wells are subject to immediate closing in for bottom-hole-pressure data and thereafter, throughout their flowing lives, a continuous record of the bottom-hole pressure is maintained, two crews being engaged on this work at Forest Reserve. In recent years, portable echometer equipment has been introduced by T.L.L. and this is used to check fluid levels in pumping wells. The principal purposes of these subsurface data are:

(1) To determine efficiency of gas lift and pumping wells.

(2) To detect the presence of thieving of oil from one sand to another.

(3) To check trends in reservoir decline.

The data are also used in making reservoir estimates, in calculating the size of reservoirs, and in determining the ultimate yield likely to be obtained, under primary and secondary-recovery operations.

Recently, it has become the practice to wash in wells by introducing oil with a high-pressure pump into the annulus between casing and tubing. This has resulted in saving a considerable amount of mud and a cleaner well from the start. It is customary to change a well from flowing direct to pumping without an intermediate stage of gas lift, though some companies have made considerable use of plunger lift. Nearly all deep pumping wells are equipped with individual electrically operated pumping units, though many of the old shallow wells are operated by central band-wheel power, driven electrically or by steam or gas engines. All major flowing wells are equipped with recording pressure gages and production is gaged individually.

Various types of dump-bucket installations have been used for measuring the production of individual pumping wells. A recent and very successful advance in bulk gaging has been made by T.L.L. engineers, involving the use of a special type of blow case, designed to function without floats, which might be affected by sand. The oil from a 250-lb. separator enters a cylinder suspended in a horizontal position. A definite weight of oil causes a pilot valve to open, permitting high-pressure gas to operate a valve system which switches the oil flow to a second blow case, while gas from the separator empties the first blow case into the delivery line. On the next cycle the head of oil in the separator is sufficient to return this gas to the 250-lb. line.

The usual capacity of blow cases is 1 bbl. per cycle with a daily capacity of 700 bbl. The number of cycles is recorded by gas meter or some other type of counter.

Production for the Island of Trinidad in December 1945 averaged just over 56,000 bbl. per day. Of this production 63 per cent was obtained by natural flow; 8.7 per cent was obtained by air lift, gas lift and plunger lift; 28 per cent by pumping, and 0.3 per cent by other methods, such as bailing and swabbing. Salt-water production averages 6,376 bbl. per day, representing 10.2 per cent of the total fluid produced. Over-all gas-oil ratio of the island averaged 1,308 cu. ft. per barrel, which figure varies only slightly with fluctuations in the drilling program.

As stated earlier, most Trinidad companies are undertaking increased exploration drilling in 1946 to offset the drain in reserves caused by their contribution to the war effort. Shortage of equipment is still the chief barrier to deep exploration in hitherto inaccessible parts of the island. However, equipment is now being received in sufficient amounts to permit exploratory drilling to begin.

One of the principal prospects in Trinidad is the Lizard Springs-Grand Lagon structure which extends some 10 miles altogether from the southeast coast. Here, Trinidad Leaseholds, who control the structure, are to drill three wildcat wells during 1946. Heavy road construction through dense tropical forest is now being undertaken.

Concessions have been granted for offshore drilling within the 3-mile limit around the southern coasts of Trinidad, and it is anticipated that, eventually, all of the Gulf of Paria outside the 3-mile limit will be leased in concessions by the Trinidad and Venezuelan governments. In the immediate future, offshore drilling will be commenced by Trinidad Northern Areas, Ltd. of Point Fortin on the westerly extension of the Point Fortin structure. Here, as elsewhere within the 3-mile limit, the Gulf of Paria is fairly shallow and sheltered.

Extensive seismograph programs are now in hand over the land areas of Trinidad. These are to be followed by seismograph and gravimetric surveys of the waters between the Trinidad Coast and the international line between Trinidad and Venezuela.

It is clear, therefore, that the companies which are engaged in developing Trinidad's oil resources do not intend to rest on the laurels which they won during the war, but are carrying into the future the progressive policy which they have followed in the past—a policy which has led to the development of a very modern and up-to-date industry.

Trinidad Exploration Program Commenced

In the accelerated programs for pushing exploration on the Island of Trinidad, B.W.I., United Oilfields of Trinidad, Ltd. (Shell) has commenced a project for exploration and drilling on the Inness anticline on the eastern side of the island.

At Erin Point on the south coast close to the shore, a subsidiary of British Controlled Oilfields, Ltd., expects to drill a marine well to 8,000 or 9,000 ft.

Present Oil Laws Adequate, Colombian Adviser Says

BOGOTA. — A draft of what is termed "an informative memorandum" on Colombia's projected revision of its oil law has been drawn up by Dr. E. Zueta-Angel, lawyer, to make it "a more workable instrument."

The memorandum discusses present status of the oil industry, causes which have held up its development, oil laws 37 and 160.4, and royalties and taxes on oil.

Survey Results

Zuleta-Angel made a survey of the Colombian oil industry in its economic and legal aspects, and his conclusions are substantially as follows: (1) the oil bill now before the Senate—the House has passed it—should be discarded, as present oil laws are in general satisfactory and adequate and only need certain slight amendments; (2) the oil bill should limit itself to what is needed and can be explained in three or four articles; (3) the area and two-concession limits per operator should be lifted; (4) court procedure should be limited to a single action with no appeal with respect to private oil; (5) the drilling-obligation provision should be regulated according to technical considerations, permitting surrender of concessions based on technical studies without drilling; (6) Congressional action on contracts within the so-called reserved zones should be done away with; (7) decisions on matters now before the Ministry and the courts should be speeded up; and (8) the 167 concession now before the Ministry should not be held up pending approval of the oil bill originally submitted to Congress in 1942.

Zuleta-Angel accompanied Colombia's President Mariano Ospina-Perez to the United States last June before the president-elect took office. Early in September, President Ospina-Perez said that the bill to amend existing oil legislation was being drafted by Minister of Petroleum Buenahora and that it was expected to be discussed with the Cabinet shortly.

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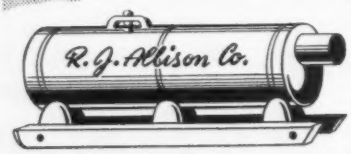

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Hobbs, N. M. . . . 275-R

Among the

Drilling Contractors

J. E. Trigg holds the drilling contract on the Frank Russell 1 Scrutchfield, in SE SW NW 34-15n-1w, Oklahoma County, Oklahoma. Same contractor also has contract of the Fox & Fox 3 Spivey, in C SW NW 31-14n-4w, Oklahoma County.

Loffland Brothers Co. holds contract on the Humble Oil & Refining Co. 8 Gulf Coast Realties, in C SW SE 19-48s-3e, newest oiler in the Sunniland pool, Collier County, Florida. The test flowed 519.20 bbl. of 24.5°-gravity oil in 24 hours through ¼-in. choke.

Penrod Drilling Co., contractor, was moving in material on the Sun Oil Co. 1 Langston, in C NW SW 8-8s-14e, Dixie County, Florida.

Lynn Drilling Co. has received contract to drill a test Big Bear Oil Co. will drill on a block of some 2,000 acres which has been assembled in Noble County, Oklahoma, by R. O. Haubelt. Big Bear Oil Co. was formed by George Halas.

West Central Drilling Co. has contract for 4,500 ft. on the Paul P. Steed et al 1 Wiley Norwood, in northeast of Section 10, Block 5, T&P Survey, 11 miles south of Merkel, in Taylor County, Texas.

Lake Drilling Service has been awarded the drilling contract on the Belgam Oil Co. 1 Britt, wildcat in SE SW SW 20-4n-7e, Pontotoc County, Oklahoma.

Sam L. Tennant Drilling Co., Blackwell, Okla., is drilling at 3,055 ft. on the Snowden Oil & Gas Co. 9 Warren, in C NE NE NE 19-28n-1e, Kay County, Oklahoma. Pits and cellar are dug for the 10 Warren in the same quarter section for the same company.

L R Oakleaf Drilling Co., Cherryvale, Kans., is drilling the sand and cleaning out on the Snowden Oil & Gas Co. 8 Warren at 3,356 ft., in SE NW NW 19-28-1e, Kay County, Oklahoma.

Iron Drilling Co. has drilling contract on the Darby & Bothwell, Inc., 1 Sankey, in SW SW SW 18-17-18w, Rush County, Kansas. This is the first of two or three proposed tests by the company in the county. Skelly Oil Co., Gulf Oil Corp., and Atlantic Refining Co. are supporting the 1 Sankey, which will be a Reagan sand tes.

Thorne Drilling Co. has been awarded drilling contract on a test A. M. Blum and Al Jaconson will drill on the Elva Allen farm in Section 5-P-26, Henderson County, Kentucky.

G. W. Miller, Mt. Carmel, Ill., is drilling contractor on the G. H. Frederman 1 Jacob W. Everwine, in NW NW 19-10n-6w, Clay County, Indiana.

Kenneth Hughes, Hazelton, Ind., will drill on contract the R. F. Brown 1 Kirby Kutch, in NE NW 2-4n-5w, Daviess County, Indiana.

J. C. Jolly & Son., Princeton, Ind., is drilling contractor on the H. Houghton 1 Arville Sloan, in SW NW 4-2s-10w, Gibson County, Indiana.

George & Wrather have been awarded drilling contract on the J. E. Bauer and W. A. Brennan 2 John M. Brevoort, in SW SE 22-2n-11w, Knox County, Indiana.

Morris & Meredith, Inc., Houston, have contract to drill Farmers Land & Cattle Co. well No. 2 for Sohio Petroleum Co. in Calcasieu Parish, Louisiana. This wildcat test is located 1½ miles north of Holmwood townsite in Section 26-10s-7w. Contract depth is 10,500 ft.

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General Petroleum, Calgary, Alta., has taken a contract to complete Roxana Petroleums 3-K, LSD 7, 31-7-6w5 from 5,100 ft. The location is on the Keystone Valley structure in the Alberta foothills, and the well is now changing from cable to rotary tools for completion.

Commonwealth Drilling Co., Calgary, Alta., has signed the contract for the first well to be drilled in Alberta for Sun Oil Co. Sun Oil 1, LSD 11, 8-18-16w4, is located in the Eyremore district in the southern plains area, and equipment is already on location.

E. V. Hilliard will drill the Eugene V. Hilliard 1 State of Michigan Roscommon-F, in NE NW NW 19-21n-3w, Roscommon County, Michigan.

Santa Maria Drilling Corp., Long Beach, is preparing to start operations on Honolulu Oil Corp. et al 1 Bates, 36-4n-25w, in the Rincon area of Ventura County, California.

Rowan Drilling Co., Fort Worth, has established division headquarters for West Texas and New Mexico in Midland. The company maintained an office in Odessa until recently. Ira French is division superintendent, Cecil Provine assistant superintendent, and Roy Durst, recently released from military service, is division engineer.

E. E. Steen and **E. A. Steen** have incorporated Steen Drilling Co., with capital stock of $100,000. Headquarters will be Houston.

Taggart Drilling Co. will drill five wells in Osceola County, Michigan, for Consumers Power Co. These are the 200, 201, 202, 203, and 205, all in Section 36-20n-7w.

Rine Drilling Co. is drilling the Lion Chemical Co. 1 Reschke, in SW SW SW 12-27-14w, Pratt County, Kansas, 5 miles southwest of the Chance pool and 6 miles northwest of Pratt. Operator has set 338 ft. of 8-in. surface pipe and well was drilling below 2,800 ft.

Ferrell & Hood are drilling contractors on the J. E. Hood 1 Township of Casco, in SW NE NE 20-1n-16w, Allegan County, Michigan.

Northern Development Co., drilling Lloydminster Gas Co. 6 in the Saskatchewan end of the Lloydminster field, has brought in the largest oil producer yet completed in Saskatchewan, with settled production around 200 bbl. The company has drilled some 30 wells in this field, and also recently completed a deep test at Watrous, Sask., for Community Services, Ltd.

The Multi-range *lightweight* BJ Type "T" Tong for Drilling or Production Rigs

Designed to lighten and speed up the job of running tubing, BJ type "T" tongs are equally valuable in "nippling up" or as lay tongs. Made in five series: A, B, C, D, and E, with available jaws in each series to handle API tubing and coupling sizes from 1" to 4", plain or upset.

Change in size of tong jaws can be made quickly and easily. The dies are self sharpening and provide a quick, positive, non-crushing grip. The handle is made of reinforced seamless tubing, and is designed to provide sturdy, balanced construction. Stabbed on, these tongs cannot come open even if hinge pin fails, yet jaws easily release by pulling back on the sleeve. Call your BJ supplier and let him equip your rigs with "T" tongs.

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PERSONALS

Hayes Takes Higher Engineering Post With Texaco

E. P. HAYES, who this week became chief petroleum engineer of the producing department, The Texas Co., was born in Chagrin Falls, Ohio, and received his early education there. After finishing high school, he studied at the Case School of Applied Science in Cleveland, Ohio, and was graduated in 1915 with a degree in mechanical engineering.

He operated his own business from 1923 to 1925. Later that year he joined the U. S. Bureau of Mines as an engineer at a helium plant in Fort Worth.

Continuing in this connection until 1930, Hayes was given an assignment with the bureau's potash division, in Carlsbad, N. M., where he remained until 1931. From 1931 to 1933 he served in the petroleum division, U.S. B.M., in Dallas and Bartlesville, Okla.

Hayes joined The Texas Co. in Houston in August 1933, and has remained with the company since. He started as assistant petroleum engineer in the South Texas division, producing department and continued in that capacity until April 1935, when he was advanced to petroleum engineer in the division.

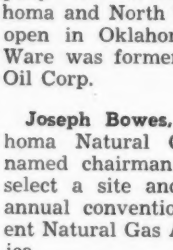
His promotion to division petroleum engineer, South Texas division, producing department, was effective in March 1938. He held that engineering post until this week when he was promoted to chief petroleum engineer of the department in Houston. A veteran of World War 1, Hayes served in the Navy from March 1918 to March 1919.

Ed Stewart, district superintendent of Ohio Oil Co., will be moved to Oklahoma City early in October with the transfer of the company's office from Edmond, Okla.

John Ware, geologist for Barnsdall Oil Co., will be in charge of the company's new division office for Oklahoma and North Texas which was to open in Oklahoma City October 1. Ware was formerly with Deep Rock Oil Corp.

Joseph Bowes, president of Oklahoma Natural Gas Co., has been named chairman of a committee to select a site and set dates for the annual convention of the Independent Natural Gas Association of America.

Harrington Wimberly, member of the Federal Power Commission, has been designated by the commission as its representative on the Interstate Oil Compact Commission.



E. W. McAllister, chief engineer of Western Gulf Oil Co., has been transferred to London where he will assume the post of chief petroleum engineer for Kuwait Oil Co., Ltd.

Sam S. Caldwell will become executive vice president of the Arkansas division of the Mid-Continent Oil and Gas Association at the expiration of his term as mayor of Shreveport, La. Caldwell formerly was an independent oil operator and has been connected with production activities of several companies.

Ernie Miller, Tide Water Associated Oil Co., Houston, has been named chairman of a committee appointed to select a successor to **R. R. Kyner** who has resigned as field chairman of the East Texas Engineering Association. Other members of the committee are: **J. M. Cooper,** Gulf Oil Corp., Houston; **L. F. Peterson,** Stanolind Oil & Gas Co., Fort Worth; **R. M. Hess,** Shell Oil Co., Inc., Kilgore; and **A. S. Rhea,** Sun Oil Co., Dallas. The last two will serve as exofficio members.

Harry R. Lewis, president of Harry R. Lewis Co., has announced the formation of Commerce Oil Corp. with offices at Warren, Pa.

A. K. Paris, chief accountant of Texas Petroleum Co. in Bogota, has been transferred to the sales division at Rio de Janeiro. **Gordon B. Musgrove** has taken over the chief accountant's duties in Colombia.

L. M. Wilson, Gulf Oil Corp. engineer, has been transferred from Pasadena, Calif., to Welch, La.

Richard H. Willis, vice president and general counsel of Mid-Continent Petroleum Corp., has been elected a director of the company.

W. F. Moore, general manager of foreign operations, and **F. C. Sealey,** manager of foreign production, The Texas Co., recently were in Barranquilla where they met **J. O. Bower,** general manager, and **J. K. Hufendick,** assistant manager, Texas Petroleum Co. (Colombian subsidiary). The party went to the 1 Velasquez camp.

Dr. Guillermo Pardo has resigned as secretary-general of the Colombian Ministry of Petroleum, and **Dr. Mario Escobar-Mejia** has been named to the post pending a permanent appointment.

C. C. Irby, manager of the Michigan producing district of Sohio Petroleum Co., has been elected a member of the Michigan State Oil Advisory Board, succeeding Glenn Bish of Ohio Oil Co. who resigned from the board following his transfer to the Mid-Continent area.

Edward C. Borrego has finished an assignment as petroleum attache with the U. S. Embassy in Rome and has assumed his duties as managing director of Societa Petrolifera Italiana, producing subsidiary of Standard Oil Co. (N. J.) in Italy.

Gonzalo Acosta, former petroleum engineer of the Colombian Ministry of Petroleum, has resigned to open an office as an oil-equipment manufacturer's representative.

L. E. Barrows, manager of the producing department of The Texas Co. in Houston, last week announced a series of organizational changes, including promotions and involving some of the company's top producing-department supervisory personnel. The changes were effective October 1. **William C. Kneale,** acting division manager, South Texas division with headquarters in Houston, was made division manager of the South Texas division. **L. T. Tighe,** drilling superintendent, South Texas division, was promoted to the position of general superintendent of drilling and production in the South Texas division. **H. H. Arnold, Jr.,** was advanced from general superintendent of producing operations in Illinois, with headquarters in Salem, Ill., to assistant division manager of the Oklahoma-Kansas-Illinois division with headquarters in Tulsa. **Donald M. Rounds,** district landman in Mattoon, Ill., succeeded Arnold. **W. V. Vietti,** Houston, while retaining his position as assistant to the manager of the producing department, also took over the duties of manager of the newly created gas division of the producing department. **E. P. Hayes,** division petroleum engineer in the South Texas division, was promoted to chief petroleum engineer of the producing department with headquarters in Houston. **W. F. Herbert,** Fort Worth, division petroleum engineer in the West Texas division, was transferred to Houston to succeed Hayes. **Don L. Harlan,** petroleum engineer in Houston, succeeded Herbert as division petroleum engineer in West Texas. **A. W. Baucum,** division petroleum engineer in the Oklahoma-Kansas-Illinois division, was transferred from Tulsa to Houston as assistant division manager in the South Texas division. **J. A. Bermingham, Jr.,** assistant division petroleum engineer in Tulsa, succeeded Baucum as division petroleum engineer in the Oklahoma-Kansas-Illinois division.

W. C. KNEALE

H. H. ARNOLD, JR.

Merrit L. Mosher, design engineer for Atlantic Refining Co. in Philadelphia, has been promoted to resident engineer in Dallas. Atlantic promotions in its refinery at Point Breeze, near Philadelphia, include: **George Thompson,** assistant general marine foreman, to general marine foreman; **Oscar Hariu,** junior chemical engineer, to assistant chemical engineer; **George W. Schell,** junior chemist, to assistant chemist; **William H. Tilley,** junior chemical engineer, to assistant chemical engineer; and **Lawrence E. Way,** junior chemical technician, to assistant chemical technician. **Glenn T. Pyle,** geologist for Atlantic at Lake Charles, La., has been promoted to assistant district geologist, and **Stanley L. Smith,** geologist at Dallas, has been promoted to regional geologist. Other promotions of Atlantic personnel in Texas include: **B. S. Cheesman,** junior geologist, to geologist at Midland; and **Donald B. Harrison,** senior chemical engineer at Dallas, to budget and schedule supervisor at the Point Breeze refinery.

Dolph Simic, geologist for Cities Service Oil Co. in the North Texas division, has resigned to become head of the geological department of Bay Petroleum Corp., with headquarters in Wichita Falls, Tex. He had been with Cities Service 10 years. **D. R. Guinn** has been transferred from Tyler, Tex., to succeed Simic.

Earl B. Noble, of Union Oil Co. of California and president of the American Association of Petroleum Geologists, will be the principal speaker at the Michigan Geological Society meeting October 10 in Ann Arbor.

E. F. Phillips has been named manager of Standard Oil Co. of New Jersey's newly organized shallow-draft marine department. He formerly was manager of the publications department in the advertising - sales promotion division. **G. O. Uhlmann** succeeds Phillips in his publications work.

E. F. PHILLIPS

Carroll E. Dobbin, of the U. S. Geological Survey, has been nominated for president of the American Association of Petroleum Geologists. Other nominations include: **George S. Buchanan,** Sohio Petroleum Corp., vice president, and **J. V. Howell,** consulting geologist of Tulsa, secretary-treasurer. The nominations were made by a committee headed by **Frank R. Clark,** retired vice president of Ohio Oil Co., and **A. I. Levorsen,** head of the geological department of Stanford University. The election will be held by mail prior to the annual meeting of the association March 24-27 in Los Angeles.

Ralph O. Dietler, general manager of the crude-oil purchasing department of Standard Oil Co. (Ind.), is in Denver visiting friends and attending to company business in the Rocky Mountain area.

Shifts—

James S. Dodson, foreman, J. S. Abercrombie Co., Bay City, Tex., to Old Ocean, Tex.; **Raymond B. Kelly, Jr.,** engineer, Humble Oil & Refining Co., Beeville, Tex., to New Orleans; **T. E. Brinson,** engineer, Sinclair Refining Co., Cleburne, Tex., to Gainesville, Tex.; **Bowen Davidson,** geologist, Magnolia Petroleum Co., Rio Grande City, Tex., to Huntsville, Tex.; **Lee O. Taylor,** foreman, Gulf Refining Co., Wink, Tex.; to Kermit, Tex.; **S. R. Cohagan,** vice president, Argo Oil Corp., Fort Worth, to San Antonio; **Neil McDowell,** geologist, Houston, to Fort Smith, Ark.; **K. M. Farnsworth,** engineer, Atlantic Refining Co., Odessa, Tex., to Denver City, Tex.; **J. M. Meyers,** foreman, Helmerich & Payne, Inc., Odessa, Tex., to Morton, Tex.; **Frank H. Clements,** engineer, Stanolind Oil & Gas Co., Pampa, Tex., to Andrews, Tex.; **A. E. Benson,** foreman, Amerada Petroleum Corp., Port Gibson, Miss., to Colorado City, Tex.; **E. B. Shade,** geologist, Ohio Oil Co., Dailey, W. Va., to Findlay, Ohio; **Theodore E. Dean,** foreman, United Fuel Gas Co., Huntington, W. Va., to Charleston, W. Va.; **W. G. Iversen,** engineer, Continental Oil Co., Wakeeney, Kans., to Ponca City, Okla.; **L. A. Lindatrom,** engineer, Ohio Oil Co., McFadden, Wyo., to Casper, Wyo.; **Clifford E. Wilson,** engineer, Continental Oil Co., Edmond, Okla., to Shawnee, Okla.; **J. A. Waymire,** foreman, Pure Oil Co., Seminole, Okla., to Madill, Okla.; **H. V. Aiguier,** superintendent, Helmerich & Payne, Inc., Many, La., to Arcadia, La.; **R. D. Morgan,** superintendent, Celanese Corp. of America, W. Monroe, La., to Natchez, Miss.; **V. L. Dickinson,** superintendent, Magnolia Petroleum Co., Smackover, Ark., to Kermit, Tex.; **R. W. Ankrcn,** superintendent, Pure Oil Co., Breckenridge, Mich., to Reed City, Mich.; **G. A. Gresham,** superintendent, Helmerich & Payne, Inc., Oklahoma City, to Garden City, Kans.; **J. C. Ott,** superintendent, Humble Oil & Refining Co., Maringoulin, La., to Roanoke, La.; **O. P. Rexroad,** foreman, Stanolind Oil & Gas Co., Edmond, Okla., to Orlando, Okla.

Charles J. Watson, general manager of Phillips Petroleum Co. in Colombia, recently accompanied the following Phillips representatives from Bartlesville to a visit with Colombian **Ministry of Petroleum Buenahora: Paul Endacott,** vice president and assistant to the president; **C. P. Dimit,** vice president in charge of production; **Don Emery,** vice president and general counsel; **C. O. Stark,** vice president in charge of the land and geological department; and **F. W. Floyd,** general manager of the foreign department. Phillips has filed concession bids covering approximately 257,000 hectares (about 635,000 acres).

Equipment Men in the News

Security Engineering Executives On Extended Trip

R. M. "Bob" Cook, general sales manager, and E. R. "Ray" Poole, manager of foreign service department, for Security

R. M. COOK

E. R. POOLE

Engineering Co., Inc., are on an extended business trip to New York, New Orleans, and Houston. After a short stay in Houston, Cook will go on to Fort Worth and Midland before returning to the home office in Whittier, Calif., while Poole will go down to Mexico City and then return to Whittier prior to his leaving for Barranquilla, Colombia, where he will make his residence as representative of the company.

Davey Appoints Distributor

Appointment of Sociedade Geral de Materiais Ltda., Av. Nilo Pecanha, Rio de Janeiro, as distributors of Davey compressors was announced recently by Paul H. Davey, president, Davey Compressor Co., Kent, Ohio.

Axelson Announces Several Personnel Changes

Announcements of a number of changes in personnel and additions to the Mid-Continent field staff are made by Axelson Manufacturing Co. These changes, effected since the war, restore a number of men to sales positions as they have reported to their old firm after returning from duty with the armed forces.

Field personnel and changes and additions to Axelson's pump and rod division in the Mid-Continent area are as follows:

Clarence W. Duplissey came to Axelson in August 1945, from Continental Supply Co., Greggton, Tex. With headquarters at Kilgore, Tex., Duplissey covers Overton and Kilgore, Tex., store points and surrounding fields served by these stores.

J. W. (Bill) Rockwell joined the company in 1937, representing the company in the South Texas territory with headquarters at Alice. He was reinstated as representative in the western Kansas territory with headquarters at Great Bend.

Trumen R. Reader, who joined the company in 1938, is now representing Axelson in Mississippi and South Louisiana territory with headquarters at Jackson, Miss.

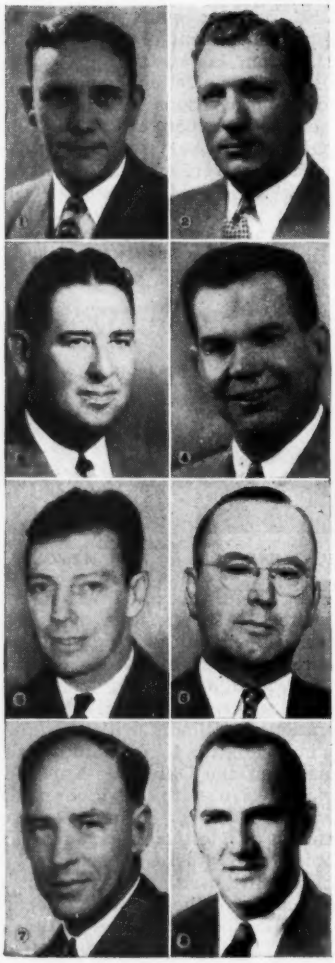
Chet Maguire now covers West Illinois with headquarters at Olney. He was first employed in September 1935 as representative at Seminole.

D. L. McDonald, first employed March 1, 1946, has been assigned the Alice-Freer, Tex., territory with headquarters at Freer.

Transfer of Earl L. Chandler from the eastern Mid-Continent division to the Dallas district also has been announced. Chandler has been connected with the company since 1926.

William A. (Bill) Russell has been appointed to the district vacated by Earl Chandler. Russell was employed by Mid-Continent Petroleum Corp., Tulsa, for over 16 years. He first joined Axelson in December 1945, covering the states of Pennsylvania, New York, Michigan, Ohio, and West Virginia with headquarters at Bradford, Pa.

Jack Brander, now headquartered at Wichita Falls, covering Electra, Muenster, and Wichita Falls district, first was employed in November 1937, and represented the company in Illinois until March 1942.



1—C. W. Duplissey. 2—W. A. Russell. 3—J. W. Rockwell. 4—T. R. Reader. 5—J. D. Brander. 6—Earl Chandler. 7—C. G. Maguire. 8—D. L. McDonald

C-R-C Places New Plane In Company Operation

A twin-engine Beechcraft airplane was put into operation recently by Crutcher-Rolfs-Cummings, Inc., pipe line equipment and materials manufacturers, Houston and Tulsa, to provide better service facilities to pipe-line operations throughout the United States.

Jim Cummings, partner in the firm, accepted delivery of the plane at Beech Aircraft Corp., Wichita.

During the first week of operation, company representatives were flown more than 10,000 miles to pipe-line operations from the West to East Coast.

Operation of this private plane places any pipe-line job in the nation within just a few hours of the main Houston office or the Tulsa branch. The plane will be used chiefly to fly technicians to various pipe-line locations, it was said.

The new twin-engine plane is silver with a red trim. The C-R-C trade-mark is painted on the nose, engine nacelles, and rudders. The company name also appears under the right wing tip. The plane is completely equipped for passenger service.

Type "A" Work Benches

Keep Tools Where You Need Them—When You Need Them

Yes sir, these benches will really pay off when you're in a bind and need a wrench in a hurry. They keep all hand tools within quick, easy reach and prevent misplacement, damage or loss.

Made of heavy steel plate, they're all-welded for strength and drawers are roller mounted for easy operation. There's plenty of storage space for hand tools, grease guns, rags, etc.

Buy one for each of your rigs . . . they'll save time, tools and tempers.

Sold Through All Supply Stores

California Distributor: Howard Supply Co., Los Angeles

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